IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF INDIANA

INDIANAPOLIS DIVISION

UNITED STATES OF AMERICA, STATE OF INDIANA, Plaintiff, v. ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION, ET AL., Defendants.	)	CIVIL ACTION NO. 83-1419 C

CONSENT DECREE

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I.

BACKGROUND

1. Pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA"), 42 U.S.C., § 9605, the United States Environmental Protection Agency ("EPA" or "the Agency") placed the Environmental Conservation and Chemical Corporation site (the "Site", "ECC", or the "Facility") on the National Priorities List, 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register. See, 48 Fed. Reg. 40670 (September 8, 1983).

2. On November 9, 1983, this Court approved a consent decree (the "1983 Decree") between the EPA, the State of Indiana, certain local governmental agencies and approximately two hundred fifty Potentially Responsible Parties ("PRPs") which provided for the funding by the PRPs of a trust to pay for the cleanup of, among other things, drums, containers and a sludge lagoon, and for the removal of certain contaminated soil at the ECC Site. The trust was funded in accordance with the 1983 Decree and the work required thereunder was completed in November 1984. The 1983 Decree approved a remedy that focused on the need for immediate action and did not finally address ground water issues at the ECC Site or soils below four feet. The purpose of the present Decree is to resolve remaining environmental issues caused by the ECC Site.

3. In response to a release or a substantial threat of a release of a hazardous substance at or from the ECC Site, the EPA

commenced a Remedial Investigation and Feasibility Study ("RIFS") for the Facility pursuant to 40 C.F.R. § 300.68. EPA completed its Remedial Investigation ("RI") Report in March 1986 and the Feasibility Study ("FS") in December 1986. EPA also prepared a Combined Alternative Analysis ("CAA") setting forth one combined remedy for ECC and the adjacent Northside Sanitary Landfill ("Northside Landfill" or "NSL"), a separate site located east of ECC.

4. In December 1986 and pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the RIFS and the CAA. EPA provided opportunity for public comment to be submitted in writing by February 28, 1987, or orally at a public meeting held in Zionsville, Indiana on December 17, 1986. Many PRPs, including Settling Defendants hereunder, provided EPA with oral and written comments on the proposed remedy before the February 1987 deadline. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA has kept a record of these comments and a transcript of the public meeting and has made these documents available to the public as part of the administrative record located at EPA, Region V, 230 South Dearborn Street, Chicago, Illinois 60604 and at the Zionsville Town Hall, 110 South 4th Street, Zionsville, Indiana 46077.

5. In January 1987 and pursuant to Section 122 of CERCLA, 42 U.S.C. § 9622, EPA notified certain parties that it had determined each party to be a PRP regarding the proposed remedial action at the Facility.

6. In accordance with Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified the State of Indiana on February 6, 1987, of negotiations with PRPs regarding the scope of the remedial design and remedial action for the Facility, and the State has participated in such negotiations and is a party to this Decree.

7. Pursuant to Section 122(j) of CERCLA, 42 U.S.C. § 9622(j), EPA notified the Federal Natural Resources Trustee of negotiations with the PRPs on the subject of addressing the release or threatened release of hazardous substances at the Facility.

8. From February through September 1987, many PRPs provided EPA with additional technical data and analysis related to EPA's proposed remedy. This information has also been made a part of the Administrative Record in this proceeding.

9. After considering the Administrative Record, EPA reached a decision on its selected remedy which was embodied in a document called a Record of Decision ("ROD"), signed by the Regional Administrator on September 25, 1987. The State concurred in EPA's ROD remedy. The ROD includes a discussion of EPA's reasons for the final remedy and for any significant changes from the proposed remedy contained in the CAA, and selected a combined remedy for ECC and NSL.

10. Pursuant to Section 117(b) of CERCLA, 42 U.S.C. § 9617(b), EPA provided public notice of the adoption of the ROD, as modified in response to public comments, including notice of the ROD's availability to the public for review in the same locations

as the administrative record referred to above. Pursuant to Section 117(d) of CERCLA, 42 U.S.C. § 9617(d), the notice was published in a major local newspaper of general circulation and included an explanation of any significant changes and reasons for such changes from the proposed remedy contained in the CAA.

11. Following issuance of the September 1987 ROD, EPA and the State (collectively, "the government") and the PRPs continued their technical discussions which then led to negotiations that have resulted in the settlement embodied in this Decree. A principal aspect of that settlement, as incorporated into Exhibit A to this Decree (which sets forth the Work to be performed hereunder), provides that a separate remedy will be implemented for ECC. The government believes that separate, complementary remedies for ECC and NSL will meet all of the environmental objectives of the ROD and will facilitate settlement. This conclusion is based upon the government's review of Exhibit A, and on the facts that PRPs at Northside and ECC are not the same, that Northside and ECC were two distinct types of operations susceptible to different remedies, that it is in the public interest to facilitate remediation of both sites by PRPs, and that such private party remediation would be facilitated by separate consent decrees and separate remedies for each site.

12. Another important aspect of the Work approved hereunder involves the use of soil vapor extraction technology to remove and destroy contaminants at ECC. During the period May through July 1988, Settling Defendants (as defined herein), at their own

expense, conducted a pilot test program of this innovative technology which demonstrated the ability to remove and destroy volatile organic contamination more rapidly than the remedy originally selected in the ROD. The separation of remedies for ECC and NSL, the use of soil vapor extraction, and other important refinements to the ECC remedy selected in the ROD, are reflected in Exhibit A hereto.

13. EPA and the State have reviewed Exhibit A and EPA, with the concurrence of the State, believes, subject to public comment, that Exhibit A and the supplemented administrative record support amending the ROD to correspond with Exhibit A. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA will provide public notice of this Consent Decree, the remedial action to be implemented as a result of it, and the proposed amended ROD submitted herewith in the same locations as the administrative record referred to above. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, the notice will be published in a major local newspaper of general circulation and will include an explanation of any significant changes and the reasons for such changes from the remedy selected in the September 1987 ROD.

14. This Decree, including Exhibit A hereto, will be subject to public comment pursuant to CERCLA.

15. If after public comment, EPA adopts an amended ROD which differs materially from the proposed amended ROD, EPA shall so notify the Settling Defendants in writing prior to moving the Court to enter the Decree. The Settling Defendants shall then have the

right, for 30 days from receipt of such notice, to withdraw without prejudice from this Decree, in which case this Decree shall be without any force and effect for any purpose as to Settling Defendants. Settling Defendants may withdraw from this Decree under the provisions of this Paragraph by filing a notice with the Court that sets forth Settling Defendants' decision to withdraw. If Settling Defendants withdraw from the Decree pursuant to this Paragraph, such withdrawal shall not affect the obligations or rights of any Premium Settling Defendant or any Settling Government Agency under this Decree. In the event of such withdrawal by Settling Defendants, all monies to be paid by such Premium Settling Defendants and Settling Government Agencies pursuant to Section V of this Decree shall be deposited into the Hazardous Substances Superfund and shall be applied in the manner provided in Section V.B.2.b below. The Parties agree and intend that this Decree shall not be entered by the Court until a motion is made to enter the Decree after the amended ROD is adopted in final form.

16. The United States, the State, and the defendant signatories to this Decree (the "Settling Defendants") (collectively, "the Parties") believe that this Decree, including the remedial work described in Exhibit A: (1) is in accordance with Section 121 of CERCLA, 42 U.S.C. § 9621; (2) is consistent with the National Contingency Plan ("NCP"), 40 C.F.R. Part 300; (3) will attain a degree of cleanup of hazardous substances, pollutants and contaminants which, at a minimum, assures protection of human health and the environment; and (4) will provide a level

or standard of control for such hazardous substances, pollutants, or contaminants which at least attains legally applicable or relevant and appropriate standards, requirements, criteria, or limitations in accordance with Section 121 of CERCLA, 42 U.S.C. § 9621(d)(2). EPA, with the concurrence of the State, has also determined that the Work required under the Consent Decree will be performed properly by Settling Defendants. The Parties recognize and intend to further hereby the public interest in expediting the remedy at the Facility and, at the same time, avoiding prolonged and complicated litigation between the Parties.

NOW, THEREFORE, it is hereby Ordered, Adjudged and Decreed:

II.

JURISDICTION

For the limited purpose of entering, implementing and enforcing this Decree, this Court has jurisdiction over the subject matter herein, and over the Parties consenting hereto. The Parties shall not challenge this Court's jurisdiction to enter and enforce this Decree.

III.

PARTIES BOUND

This Decree applies to and is binding upon the undersigned Parties and their successors and assigns. The undersigned representative of each party to this Decree certifies that he or she is fully authorized by the party or parties whom she or he represents to enter into the terms and conditions of the Decree and to execute and legally bind that party to it. Settling Defendants

shall provide a copy of this Decree to any Contractor hired to perform the Work or Additional Work required hereunder and shall require any such Contractor to comply with the applicable terms of this Decree, including Exhibit A.

IV.

DEFINITIONS

Whenever the following terms are used in this Consent Decree and the Exhibits attached hereto, the following definitions specified in this Paragraph shall apply:

A. "Additional Work" means the design, construction and implementation at the ECC site of remedial action which may be required pursuant to Section VII below, and which may include the "contingent additional work" described in Section 3.3 of Exhibit A, including collection and treatment of ground water.

B. "Cleanup Standards" means (1) the cleanup standards set forth in Table 3-1 of Exhibit A, compliance with which shall be determined in accordance with Exhibit A including, without limitation, the footnotes to Table 3-1 and Sections 4.2 and 4.3; and (2) the Performance Standards for the RCRA-compliant cover as specified in Section 2.1.2 of Exhibit A.

C. "Consent Decree" or "Decree" means this Decree and all Exhibits hereto, which Exhibits are specifically incorporated by reference herein and made an enforceable part hereof.

D. "Contractor" means the company or companies (including any subcontractors) retained by or on behalf of Settling Defendants to prepare the construction plans and specifications necessary to

accomplish the Work or to undertake and complete the Work required by this Decree.

E. "Premium Settling Defendants" means those parties listed in Attachment 1 to Exhibit D to this Decree who pay money as required by the ECC 468B Trust Fund pursuant to Section V.B.2. Premium Settling Defendants were also parties to the 1983 Decree.

F. "Settling Government Agencies" means (1) the United States Postal Service and the United States Navy listed in Attachment 2 to Exhibit D to this Decree who pay money to the ECC 468B Trust Fund pursuant to Section V.B.2; and (2) the state agencies listed in Attachment 2 to Exhibit D to this Decree who pay money to the ECC 468B Trust Fund Agreement pursuant to Section V.B.2. Settling Government Agencies were also parties to the 1983 Decree.

G. "ECC", the "Site" and the "Facility" refer to the real property as depicted on the map attached as Exhibit B, consisting of approximately 6.5 acres and located approximately 10 miles northwest of Indianapolis on U.S. Highway 421 near Zionsville, Indiana where Environmental Conservation and Chemical Corporation conducted its operations.

H. "ECC Trust Funds" means the two trust funds funded as provided in Section V.B below which shall be used to pay for, among other things, the implementation of the Work and, if necessary, Additional Work.

I. "EPA" means the United States Environmental Protection Agency.

J. "Future liability" refers to liability, if any, arising after EPA's Certification of Completion is issued pursuant to Section XXVI.

K. "Hazardous substance" shall have the meaning provided in Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

L. "IDEM" means the Indiana Department of Environmental Management.

M. "National Contingency Plan" or "NCP" shall be used as that term is used in Section 105 of CERCLA, 42 U.S.C. § 9605.

N. "Parties" means the Plaintiffs, Settling Defendants, Settling Government Agencies and Premium Settling Defendants.

O. "Plaintiffs" means the United States of America and the State of Indiana.

P. "Response Costs" means any costs incurred by Plaintiffs pursuant to 42 U.S.C. § 9601 et seq., which are not inconsistent with the National Contingency Plan.

Q. "Settling Defendants" means those parties other than the Plaintiffs, Premium Settling Defendants, and Settling Government Agencies who sign this Decree. Settling Defendants were also parties to the 1983 Decree.

R. "State" means the State of Indiana and all of its agencies or representatives.

S. "Trustee" means the person(s) or entity(ies) who (which) will manage the ECC Trust Funds.

T. "United States" means the United States of America and its agencies and representatives.

U. "DOJ" means the United States Department of Justice.

V. "Work" means the design, construction and implementation of the tasks as set forth in Exhibit A.

V.

GENERAL PROVISIONS

A. Settling Defendants shall finance and require to have performed as provided herein the Work and, if and to the extent applicable, Additional Work, in accordance with the requirements of all applicable local, state and federal laws, regulations and permits. The United States and the State have determined that the obligations and procedures authorized under this Decree are consistent with the authority of the United States and the State under applicable law to establish appropriate remedial measures for the Facility.

B. ECC Trust Funds:

1. ECC Trust Fund Agreement

a. Settling Defendants shall submit to Plaintiffs a signed ECC Trust Fund Agreement ("ETFA") establishing the ECC Trust Fund ("ETF") in the form attached hereto as Exhibit C within ten (10) days of the effective date of this Decree. The ETFA shall be construed to confer upon the Trustee(s) sufficient powers and authority to raise and administer funds from Settling Defendants necessary to finance the Work and, if necessary, Additional Work.

b. Within sixty (60) days after the effective date of this Decree, each Settling Defendant shall make its respective

payment to the ETF in accordance with the ETFA. Settling Defendants shall instruct the Trustee(s) to use the money in the ETF (1) to pay the Contractor for the Work and, if required, Additional Work, and (2) to reimburse the United States and the State as provided in Section XVI for Response Costs, including Oversight Costs; provided, however, the Trustee(s) of the ETF shall first seek payment of any such amounts specified in subparagraphs 1 and 2 immediately above from the Trustee(s) of the ECC 468B Trust Fund until such time as the ECC 468B Trust Fund is depleted, and the Trustee(s) of the ECC 468B Trust Fund shall promptly make such payments.

c. Pursuant to the terms of the ETFA, if the cost of the Work or Additional Work exceeds the amounts allocated for the Work or Additional Work and paid under subparagraph B.1.b of this Section, Settling Defendants, upon notification from, and within the time prescribed by, the Trustee(s), but no later than sixty (60) days after notification, shall be responsible for and shall pay to the ETF such additional amounts in the same proportions relative to each other as shown in Exhibit C. If any Settling Defendant fails to pay any such additional amount, upon notice by the Trustees, the other Settling Defendants shall pay that amount in the same proportion relative to each other as set forth in Exhibit C within sixty (60) days of notice by the Trustee. The failure of any Settling Defendant to pay for its share of the costs of the Work or Additional Work, including increased costs, shall

not excuse timely completion of the Work or Additional Work and reimbursement of costs.

d. The Trustee(s) shall submit a financial report to the ~~Parties~~ Plaintiffs and Settling Defendants on a semi-annual basis, beginning six months after the effective date of this Decree. The financial report shall include cash flow projections that project the level of funds that will be necessary for the Work for the succeeding one year period. If the amount of money in the ETF is less than such projected level, Settling Defendants shall make the necessary additional payments in amounts prescribed by the Trustee(s). The Trustee(s) shall notify Plaintiffs of the amount of, and time within which, the payments are required.

2. ECC 468B Trust Fund Agreement

a. The Premium Settling Defendants and Settling Government Agencies, other than the U.S. Postal Service and the U.S. Navy, shall submit to the Plaintiffs a signed ECC 468B Trust Fund Agreement in the form attached hereto as Exhibit D within ten (10) days of the effective date of this Consent Decree. The U.S. Postal Service and the U.S. Navy shall make their respective payments into the ECC 468B Trust Fund pursuant to Section V.B.2.b as if these Settling Government Agencies had signed the ECC 468B Trust Fund Agreement.

b. Within sixty (60) days after the effective date of this Decree, each Premium Settling Defendant and each Settling Government Agency shall make its respective payment to the ECC Section 468B Trust Fund in the amount shown in the payment schedule

in Exhibit D. Premium Settling Defendants and the Settling Government Agencies shall instruct the Trustee(s) of the ECC 468B Trust Fund to use all of the money in that fund for two purposes: (1) To pay the Trustee(s) of the ETF so that money can be used to reimburse Plaintiffs up to the amount provided in Section XVI.A (which covers that portion of Response Costs incurred prior to entry of this Decree for which Settling Defendants were not released under the 1983 Decree); and (2) To the extent funds remain, to pay the Trustee(s) of the ETF for the remaining expenses listed in subparagraph V.B.1.b above. If Settling Defendants exercise their right to withdraw from this Decree as provided at Section I, paragraph 14, above, all money in the ECC 468B Trust Fund shall be applied first to reimburse the United States and the State for their Response Costs incurred prior to the entry of this Decree as provided in Section XVI.A below, and then to any other costs for which the government claims Premium Settling Defendants are liable; that is, no such money shall be applied to costs as to which the government has covenanted not to sue such defendants under the 1983 Consent Decree.

c. The Trustee(s) shall submit a financial report to the Parties on a semi-annual basis, beginning six months after the effective date of this Decree and continuing until the termination of the ECC 468B Trust Fund. The financial report shall show the financial condition of the ECC 468B Trust Fund, including, without limitation, income and expense of the Fund for the period.

3. Nothing in this Decree constitutes approval by the Plaintiffs of the ETFA or the ECC 468B Trust Fund Agreement for any purposes other than for the purpose of implementing the requirements of this Decree. Payments into both trust funds established hereunder shall not constitute penalties or monetary sanctions.

VI.

THE WORK

A. Settling Defendants shall require the Work to be performed and completed as provided herein in accordance with all requirements of this Decree, Exhibit A, and all applicable local, state and federal laws, regulations and permits. The United States and the State have determined that Work (and if necessary under Section VII, Additional Work) required under this Decree are consistent with the authority of the United States and the State under applicable law to establish appropriate remedial measures for the Facility.

B. In accordance with Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), no federal, state, or local permits are required for those portions of the Work conducted entirely on-site. Settling Defendants shall make timely application for any and all permits that may be required to conduct the Work.

C. The standards and provisions of Section XIII hereof describing Force Majeure shall govern delays in receiving any permits required for the Work (and, if necessary, Additional Work) and also the denial of any such permits.

D. Settling Defendants shall require to be included in all contracts (including subcontracts) entered into for the Work, provisions stating that such Contractors, including their agents and employees, shall comply with all applicable laws and regulations in performing all activities required by such contracts. This Decree is not, nor shall it act as, nor is it intended by the Parties to be, a permit issued pursuant to any federal or state statute or regulation.

E. The Work shall be initiated, performed and completed in accordance with Exhibit A.

F. Subject to Settling Defendants' right to invoke Dispute Resolution pursuant to Section XIV, Settling Defendants shall implement the Work, and, as provided under Section VII below, Additional Work, upon EPA approval (after consultation with the State) of (1) the deliverables referred to in Section 5.0 of Exhibit A with respect to the Work, or (2) EPA approval of deliverables to be submitted for any Additional Work. Unless otherwise directed by EPA in writing, Settling Defendants shall not commence field activities until EPA approves such deliverables. All Work (or Additional Work) shall be conducted in accordance with the National Contingency Plan, the EPA Superfund Remedial Design and Remedial Action Guidance, and the specifications of this Decree, including the standards, specifications and schedules developed hereunder.

G. It is the goal and intent of the Parties that implementing the Work will achieve the Cleanup Standards set forth

in Table 3-1 of Exhibit A; however, if implementing the Work does not achieve the Cleanup Standards, Additional Work may be required as specified in Section VII below. Moreover, the Parties acknowledge and agree that EPA's approval of Exhibit A (1) does not constitute a warranty or representation of any kind by EPA that implementing Exhibit A will achieve the Cleanup Standards and (2) shall not foreclose EPA from seeking performance of all terms and conditions of this Decree.

H. Modification of Exhibit A:

1. If any provision of Exhibit A is determined to be ineffective or inefficient in accomplishing the Cleanup Standards set forth in Table 3-1 of Exhibit A, EPA, the State or Settling Defendants may request that the relevant sections of Exhibit A be modified to make better provision for accomplishing the Cleanup Standards.

2. Any request for modification of Exhibit A under this paragraph, and the final responses of the other Parties, shall be reflected in writing and served upon all Parties. If the Parties agree, modification of Exhibit A may be effected by written stipulation filed with the Court.

3. No provision of this Consent Decree may be construed or applied or modified to obligate Settling Defendants to meet any cleanup criteria which differ from the Cleanup Standards set forth in Exhibit A hereto. This Paragraph VI.H.3 shall not be subject to Section XIV of this Decree. Nothing herein shall preclude EPA from adopting cleanup criteria which differ from the Cleanup

Standards if necessary to protect human health and the environment and, subject to the limitations of Section XVIII, from seeking further relief from Settling Defendants.

VII.

ADDITIONAL WORK

A. If after 5 years of operation of the soil vapor extraction system provided for in Section 2.1.1 of Exhibit A, EPA determines, after consultation with.the State, that the soil vapor extraction system has not met the Cleanup Standards set forth in Table 3-1 of Exhibit A, Settling Defendants agree to implement the remedial action specified in Section 3.3 of Exhibit A, unless the Parties agree otherwise.

B. Any disputes relating to the need for and nature of Additional Work shall be resolved pursuant to Paragraph G of Section XIV below (Dispute Resolution).

C. Nothing in this Section shall preclude the Parties from mutually agreeing to continue the Work beyond the five-year period referenced in Paragraph A above.

D. Nothing in this Section shall preclude Settling Defendants from terminating the Work before the expiration of the five-year period described in Paragraph A above and initiating Additional Work at that time so long as Settling Defendants provide EPA and the State with thirty (30) days written notice prior to terminating the Work.

VIII.

EPA PERIODIC REVIEW TO ASSURE
PROTECTION OF HUMAN HEALTH AND ENVIRONMENT

A. To the extent required by Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), EPA shall review the remedial action at the Facility at least every five (5) years after the entry of this Decree to assure that human health and the environment are being protected by the remedial action being implemented. If, upon such review, EPA determines that further response action in accordance with Sections 104 or 106 of CERCLA, 42 U.S.C. §§ 9604, 9606, is appropriate at the Facility, then, to the extent permitted under Section XVIII.C of this Decree, EPA, after consultation with the State, may take or seek to require such action.

B. Settling Defendants shall be provided with an opportunity to confer with EPA and the State regarding any additional remedial action that EPA may believe is appropriate as a result of the Periodic Review described in Paragraph A above. The provisions of Section 113(j) of CERCLA, 42 U.S.C. § 9613(j), where applicable, will govern any judicial review of EPA's determination that any such additional remedial action is necessary or the nature of any such action.

IX.

QUALITY ASSURANCE

Settling Defendants shall require their Contractor to use quality assurance, quality control, and chain of custody procedures in accordance with EPA's "Interim Guidelines and Specifications For

Preparing Quality Assurance Project Plans," (QAM-005/80), and any subsequent, final amendments to such guidelines, upon written notification to Settling Defendants of such amendments by EPA for subsequent sampling and analysis events. Prior to the commencement of any monitoring project under this Decree, Settling Defendants shall require their Contractor to submit a Quality Assurance Project Plan ("QAPP") to EPA and the State that is consistent with Exhibit A and applicable guidelines. EPA, after review of the QAPP(s) and the State's comments thereon, will notify Settling Defendants of any required modifications, conditional approval, disapproval, or approval of the QAPP(s). Upon notification of disapproval or any need for modifications, Settling Defendants shall make all required modifications in the QAPP, subject to their right to invoke Dispute Resolution under Section XIV below. Sampling data generated consistent with the QAPP shall be admissible as evidence, without objection, in any proceeding under this Decree, except the Parties reserve all rights with respect to the weight, if any, to be accorded such evidence. Settling Defendants reserve all rights with respect to the admissibility into evidence of, and the weight, if any, to be accorded, such sampling data in any other proceedings. Settling Defendants shall assure that EPA personnel or authorized representatives are allowed access at reasonable times to any laboratory utilized on behalf of Settling Defendants in implementing this Decree and shall require said laboratory(ies) to analyze samples submitted by EPA, as part

of its oversight activities hereunder, for quality assurance purposes.

X.

FACILITY ACCESS, SAMPLING, DOCUMENT AVAILABILITY

A. To the extent that the Facility or other areas where Work (or Additional Work) is to be performed hereunder is presently owned by persons other than those bound by this Decree, Settling Defendants shall use their best efforts to obtain access agreements from the present owners within sixty (60) calendar days of entry of this Decree for purposes of implementing the requirements of this Decree. Such agreement shall provide access for the Parties and their authorized representatives. If such access agreements are not obtained within the time specified herein, Settling Defendants shall so notify EPA and the State. Provided that Settling Defendants have utilized their best efforts to obtain timely access, any delays encountered or inability to obtain any necessary access under this Decree shall constitute Force Majeure under Section XIII below. Best efforts shall not require commencement of litigation against owners of the Facility.

B. The Parties shall make available to each other the results of all validated sampling and/or tests or other data generated in performance of this Decree, and, in the case of Settling Defendants, shall submit these results in progress reports as described in Section XII of this Decree (Reporting Requirements). Each Party may review, upon request, all sampling

data generated by any other party as part of the Work conducted under this Decree.

C. Any party collecting samples pursuant to the performance of this Decree shall allow, upon request, split or duplicate samples to be taken by any other Party and/or their authorized representatives and shall provide the other Parties not less than seven (7) days advance notice of any such sample collection activity; provided, however, that if seven (7) days notice is not practical under the circumstances, such Party shall provide reasonable notice of the sampling activity. All Parties will provide the other Parties with all results of any split sample analyses.

XI.

REMEDIAL PROJECT MANAGER/PROJECT COORDINATORS

A. EPA shall designate a Remedial Project Manager ("RPM") or an On-Scene Coordinator ("OSC") (hereafter collectively called "RPM/OSC"), and the State shall designate a Project Coordinator ("Project Coordinator") for the Facility. Plaintiffs may designate other representatives, including EPA and State employees, and federal and state contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Decree. The RPM/OSC shall have the authority lawfully vested in an RPM/OSC by the National Contingency Plan, 40 C.F.R. Part 300. In addition, EPA reserves the right, to the extent provided by law and consistent with Section XVIII below, to take any necessary response action when conditions at the Facility present an imminent

and substantial endangerment to public health, welfare or the environment.

B. Settling Defendants shall designate a Project Manager ("Project Manager") who shall have primary responsibility for implementation of the Work, and, if necessary, Additional Work, at the Facility.

C. To the maximum extent possible, except as specifically provided in this Decree, communications between Settling Defendants, the State and EPA concerning the terms and conditions of this Decree shall be made between the Project Manager, the Project Coordinator, and the RPM/OSC.

D. Within twenty (20) calendar days of the effective date of this Decree, Settling Defendants, the State and EPA shall notify each other, in writing, of the name, address and telephone number of the designated Project Manager, Project Coordinator and an Alternate Project Coordinator, and RPM/OSC and Alternate RPM/OSC. The Parties will notify each other in writing of any changes to the originally-supplied information under this Paragraph D within twenty (20) days of any such change.

XII.

REPORTING REQUIREMENTS

A. Settling Defendants shall require their Contractor to prepare and provide to EPA, DOJ and the State written progress reports which, for each reporting period: (1) describe the actions which have been taken toward achieving compliance with this Decree; (2) include all validated results of sampling and tests and all

other data relating to the Work or Additional Work received by Settling Defendants; (3) describe all portions of the Work or Additional Work completed under Exhibit A and attach copies of appropriate supporting documentation such as invoices, contract documents and photographs, if any; (4) describe all actions, data and plans which are scheduled for the next reporting period and provide other information relating to the progress of construction as is customary in the industry; and (5) include information regarding percentage of completion and unresolved delays encountered, or anticipated, that may affect the future schedule of major milestones in the implementation of the Work or Additional Work, a description of efforts made to investigate those delays or anticipated delays, and a description of any missed deadlines or other violations of this Decree which may give rise to stipulated penalties under Section XVII of this Decree. These progress reports will be submitted to EPA, DOJ and the State on a monthly basis by the fourteenth day of each month during the period the remedial action required hereunder is being constructed. For the purposes of this Paragraph, construction of the remedy will be completed when the soil vapor extraction system, the RCRA-compliant cover, and monitoring wells are installed as required by Exhibit A. Once such construction is completed, the schedule for submitting such progress reports may be modified to provide for quarterly reports.

B. If the date for submission of any item or notification required by this Decree falls upon a weekend or state or federal

holiday, the time period for submission of that item or notification will be extended to the next business day following the weekend or holiday.

C. Upon the occurrence of any event during performance of the Work which, pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, requires reporting to the National Response Center, Settling Defendants shall require prompt oral notification to the RPM or OSC and to the State's Emergency Response Section, in accordance with IND. CODE § 13-7. If the RPM/OSC or Project Coordinator is unavailable, Settling Defendants shall require their Contractor to notify the Emergency Response Section, Region V, EPA. The above notification is in addition to the reporting required by Section 103 of CERCLA. Settling Defendants shall require their Contractor to furnish Plaintiffs (1) a written report within 20 days of the onset of such an event setting forth the events which occurred and the measures taken, and to be taken, in response thereto, and (2) within 30 days of the conclusion of such an event, a report setting forth all actions taken to respond thereto.

XIII.

FORCE MAJEURE

A. For purposes of this Decree, "Force Majeure" is defined as any event arising from causes beyond the control of Settling Defendants which delays or prevents the performance of any obligation under this Decree. Force majeure shall not include increased costs or expenses or non-attainment of Cleanup Standards. However, any event which would otherwise qualify as a force majeure

event shall not be disqualified simply because it results in increased costs.

B. When circumstances occur which may delay or prevent the completion of any phase of the Work, or delay or prevent access to the Facility or to any property on which any part of the Work is to be performed, whether or not caused by a force majeure event, Settling Defendants shall promptly notify the RPM/OSC and the State Project Coordinator by telephone or, in the event of their unavailability, the Director of the Waste Management Division of EPA. Within twenty (20) days of the circumstances which Settling Defendants contend are responsible for the delay or obstacle to performance, Settling Defendants shall supply to Plaintiffs in writing a description of and reason(s) for the event(s), the anticipated duration of any delay, the measures taken and to be taken by or on behalf of Settling Defendants to prevent or minimize the delay or effects of such event(s), and the timetable for implementation of such measures. Failure to give timely notice to the RPM/OSC and State Project Coordinator under this Paragraph B will constitute a waiver of any claim of force majeure.

C. If EPA agrees that the delay or obstacle to performance is or was attributable to a force majeure event, the Parties shall modify Exhibit A or, as appropriate, schedules developed thereunder to provide such additional time, or to take into account such obstacles, as may be necessary to allow the completion of the specific phase of Work and/or any succeeding phase of the Work affected by such delay or obstacle. Such additional time shall not

exceed the actual duration of the delay resulting from the force majeure event, unless the Parties agree otherwise.

D. If the Parties cannot agree whether the obstacle to performance or reason for the delay was caused by a force majeure event, or whether the duration of the delay is or was warranted under the circumstances, any party may invoke the dispute resolution provisions of Section XIV below. Settling Defendants will have the burden of proving force majeure as a defense to a failure to comply with this Decree.

XIV.

DISPUTE RESOLUTION

A. The Parties shall attempt to resolve expeditiously and informally any disputes that arise under this Decree.

B. If any dispute arising under this Decree is not resolved expeditiously through informal means, any Party may initiate dispute resolution under this Section by serving prompt written notice by certified mail on the other Parties.

C. Within ten (10) days of the service of a notice of dispute under paragraph B above, the Party who gave notice shall serve on the other Parties a written statement of the issues in dispute; the relevant facts upon which the dispute is based; factual data, analysis or opinion supporting its position; and all supporting documentation on which such Party relies (hereinafter "Statement of Position"). Any response by a Party to any such Statement of Position shall be served on all other Parties within ten (10) days of receiving such a Statement of Position. The

Parties, by agreement, may alter or extend any deadlines under this Section XIV.

D. An administrative record of any dispute under this Section shall be maintained by EPA and shall include the written notification of such dispute, the Statement of Position, any responses thereto, and EPA's final determination with respect to any such dispute. The record shall also include any additional information submitted for the record by any Party on which all Parties shall have a reasonable opportunity to comment.

E. Any Party shall have the right to petition the Court for a review of EPA's final determination under this Section XIV. Any Party may file such a petition prior to the issuance of EPA's final determination if the circumstances require prompt resolution. However, in such a case, EPA shall have a reasonable opportunity to render its decision.

F. The administrative and judicial dispute resolution procedures of this Section XIV shall be the exclusive mechanism to resolve disputes arising under this Decree and shall apply to all provisions of this Decree unless otherwise expressly provided. The invocation of the procedures stated in this Section shall not alter Settling Defendants' obligations under this Decree with respect to the disputed issues or any other requirement of this Decree unless and until the Court orders otherwise.

G. In judicial proceedings on any dispute relating to whether the Work or Additional Work has been performed as required by this Decree, or relating to the necessity for or nature of

Additional Work, or relating to designs and plans to implement Work or Additional Work, Settling Defendants shall have the burden of emonstrating, based on the administrative record developed under Paragraph D of this Section, that the position of EPA is arbitrary and capricious or otherwise not in accordance with law or this Decree.

H. In any judicial proceeding where Settling Defendants allege delay or impossibility attributable to force majeure, they shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by circumstances beyond their control, and that the duration of the delay is or was warranted under the circumstances; provided, however, that nothing in this Paragraph H is intended to limit or otherwise alter the appropriate standard of review for matters covered in Paragraph G of this Section.

I. Except as provided in Paragraphs G and H of this Section, this Decree does not establish scopes of review, burdens of proof, or standards of any kind for judicial review of disputes between the Parties.

XV.

RETENTION AND AVAILABILITY OF INFORMATION

A. Documents Relating to Performance of this Decree.

1. Documents generated prior to termination of the Decree. During the pendency of this Decree and for a period of five (5) years after its termination, Settling Defendants shall require their Contractor to retain and to make available to EPA,

DOJ, and the State all records and documents in its possession, custody or control which relate to the performance of this Decree, including, without limitation, documents reflecting the results of any sampling, tests, or other data or information generated or acquired by it, or on its behalf, with respect to the Facility. After the five (5) year period of document retention, Settling Defendants shall require their Contractor to notify EPA, DOJ and the State at least ninety (90) days prior to the destruction of any such documents, and upon request by EPA, DOJ or the State, shall relinquish custody of said documents to EPA, DOJ or the State.

2. Documents generated after termination of the Decree. If any records or documents relating to the performance of this Decree are generated after termination of this Decree, Settling Defendants shall require their Contractor to retain and to make available to EPA, DOJ, and the State all such records and documents in its possession, custody or control, for a period of ten years after their generation, including, without limitation, documents reflecting the results of any sampling, tests, or other data or information generated or acquired by it, or on its behalf, with respect to the Facility. After this ten (10) year period of document retention, Settling Defendants shall require their Contractor to notify EPA, DOJ, and the State at least ninety (90) days prior to the destruction of any such documents, and upon request by EPA, DOJ or the State, shall relinquish custody of said documents to EPA, DOJ or the State.

B. Documents Relating to the Alleged Liability of Settling Defendants. During the pendency of this Decree and for a period of five (5) years after its termination, Settling Defendants shall retain and make available to EPA, DOJ, and the State all records and documents in their possession, custody, or control pertaining to their own or any other person's alleged liability at ECC for response action or costs under CERCLA not previously provided to EPA. After the five (5) year period of document retention, Settling Defendants shall notify EPA, DOJ and the State at least ninety (90) days prior to the destruction of any such documents, and upon request by EPA, DOJ or the State, Settling Defendants shall relinquish custody of the documents to EPA, DOJ or the State. Nothing in this Paragraph or in Paragraph A immediately above shall preclude EPA, DOJ or the State from requesting copies of the documents described hereunder at any time prior to their destruction.

C. Settling Defendants or their Contractor may assert business confidentiality claims covering part or all of the information provided in connection with this Decree in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and pursuant to 40 C.F.R. § 2.203(b) and applicable State law.

D. Information determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B and, if determined to be entitled to confidential treatment under state law by the State, afforded protection under state law by the State. If no such claim accompanies the information when it is

submitted to EPA and the State, the public may be given access to such information without further notice to Settling Defendants.

E. Information acquired or generated in performance of the Work that is subject to the provisions of Section 104(e)(7)(F) of CERCLA, 42 U.S.C. § 9604(e)(7)(F), shall not be claimed as confidential by Settling Defendants or their Contractor.

F. In the event that Settling Defendants' obligations to produce documents under this Section includes documents which are privileged from disclosure as attorney-client communications, attorney work-product or other privilege recognized by law, Settling Defendants may withhold production of such documents to avoid improper disclosure until agreement is reached with the United States and the State as appropriate, or, if agreement cannot be reached, until resolution of the issue is reached pursuant to Section XIV (Dispute Resolution). However, Settling Defendants must provide the United States and the State, as appropriate, with a list of the documents sought to be withheld, identifying subject, author, addressee(s) and date for each document, and any other information necessary to determine whether the document is privileged. Further, Settling Defendants shall not withhold as privileged any information or documents that are created, generated or collected pursuant to requirements of this Decree, regardless of whether the document has been generated in the form of an attorney-client communication or other generally privileged manner. Settling Defendants may not withhold as privileged any documents

that are subject to the public disclosure provision of Section 104(e)(7)(F) of CERCLA, 42 U.S.C. § 9604(e)(7)(F).

XVI.

REIMBURSEMENT

A. Settling Defendants shall pay, within sixty (60) days of the entry of this Consent Decree:

(1) $700,000 to the EPA Hazardous Substances Superfund delivered to EPA Region V, Attn: Superfund Accounting, P.O. Box 70753, Chicago, IL 60673, in the form of a wire transfer or certified or cashier's check payable to "EPA Hazardous Substances Superfund" (a copy of such check shall be sent to the Director, Waste Management Division, U.S. EPA, Region V and to the DOJ addressee set forth in Section XXII below). Payments to the United States shall include a reference, "Enviro Chem #30", and the docket number of this case;

(2) $15,437 to the State delivered to the Indiana Department of Environmental Management, 105 South Meridian Street, Indianapolis, IN 46206-6015, in the form of a wire transfer or cashiers or certified check made payable to "Indiana Department of Environmental Management, ATTN: Cashier" (a copy of such check shall be sent to the Attorney General of the State);

(3) $22,500 to the Office of the Secretary, Department of Interior, Fiscal Section, 18th and E Street, N.W.,

Washington, D.C. 20240. The check should reference the Enviro-Chem Site with a copy of the check sent to the Office of Environmental Project Review, Department of Interior, 18th and C Street, N.W., Washington, D.C. 20240; and

(4) $5,250 to the Indiana Department of Natural Resources, Office of the Director, 608 State Office Building, Indianapolis, Indiana 46204.

B. The payments made under Paragraph A(1) and (2) above are reimbursement of past costs claimed by the United States and the State in this action. In consideration of the monies received under the above Paragraph, the United States and the State covenant not to sue Settling Defendants for any costs incurred prior to the entry date of this Consent Decree.

C. Settling Defendants shall pay all response costs of the United States and the State which are not inconsistent with the NCP incurred after the entry of this Consent Decree in overseeing implementation of the Work and, if necessary, Additional Work (hereafter, "oversight costs"); provided, however, Settling Defendants shall not be liable for paying government oversight costs incurred in overseeing the Work in excess of $850,000. Response costs incurred by the United States in overseeing implementation of Additional Work, if any, and in seeking to enforce the terms of this Decree, shall not be subject to the $850,000 limit in the preceding sentence. Payments shall be made on an annual basis and within 30 days of the submission of itemized

cost statements and supporting documentation by the United States and the State. The United States and the State shall submit their oversight cost claims as soon as practicable after each anniversary date of this Consent Decree.

D. In consideration of and upon payment of all oversight costs as required by this Section, the United States and the State covenant not to sue Settling Defendants for any oversight costs incurred in overseeing the Work or the Additional Work, if any.

E. If reimbursement is owed for oversight costs at the time the United States and the State plan to terminate this Decree, Settling Defendants shall, within thirty (30) days of the submission of an itemized cost statement and supporting documentation by the United States and the State, and before termination of this Decree, pay such costs.

F. The Response Costs reimbursed in accordance with Paragraphs A, B and C of this Section, respectively, are consistent with the National Contingency Plan.

XVII.

STIPULATED PENALTIES

A. Penalties. The Settling Defendants shall be liable to the Plaintiffs for payment of stipulated penalties for each of the following violations of this Decree, unless the violation is excused pursuant to Section XIII (Force Majeure), or is reduced or waived by Plaintiffs in accordance with Subparagraph A.3 below:

1. Late Reports. For each day that the Settling Defendants fail to submit periodic progress reports in

accordance with Section XII of the Decree: $500 for the first 7 days; $1,000 for the 8th through 30th days; and $1,500 for each day after the 30th day.

2. Delayed Work. For each day that any major milestone specified below in this Subparagraph A.2.a through A.2.g of this Section is delayed: $1,500 for the first 7 days; $4,000 for the 8th through 30th days; $6,500 for the 31st through the 60th day; and $9,000 a day after the 60th day.

a. Submission of the project plans, construction contract specifications and revised drawings necessary to solicit competitive bidding as required in Section 5.0 of Exhibit A -- three (3) months from the entry of the Decree.

b. Completion of site preparation, including grading, removal of the tanks and buildings, repair or moving of the fence -- 4 months after approval by EPA of the documents referred to in subparagraph A.2.a above. Completion of site preparation shall mean that all hindrances, obstructions or obstacles to construction and security of the soil vapor extraction trenches, monitoring wells or cap have been removed.

c. Completion of installation of the on-site and off-site monitoring wells -- 5 months after approval

by EPA of the documents referred to in subparagraph A.2.a above.

d. Startup of the soil vapor extraction system -- 10 months after approval by EPA of the documents referred to in subparagraph A.2.a above.

e. Completion of installation of the cap -- eleven (11) months after EPA approval of the documents referred to in subparagraph A.2.a above.

f. Submission of all documents necessary to perform Additional Work that may be required under Section VII of this Decree -- 6 months after written notice is provided by EPA or Settling Defendants that Additional Work needs to be implemented.

g. Completion of installation of the ground water collection trench -- on a schedule to be approved by EPA after consultation with the State.

3. Stipulated penalties for major milestones A.2.b and A.2.c may be waived by Plaintiffs, in whole or in part, at their discretion, if Settling Defendants startup the soil vapor extraction system and complete installation of the cap within 10 and 11 months, respectively, after approval by EPA of the documents referred to in subparagraph A.2.a above.

4. Forgiveness of Certain Delayed Work Penalties. Any stipulated penalties incurred for any of the major milestones listed in subparagraphs A.2.b and A.2.c above

shall be collected as specified pursuant to Paragraphs C and D below, but shall be paid into an escrow account and shall remain there until the earlier of (a) the startup of the soil vapor extraction system and installation of all components of the cap, or (b) 11 months after approval by EPA of the documents referred to in subparagraph A.2.a above. If startup of the soil vapor extraction system and completion of the cap do not occur within 10 and 11 months, respectively, after approval by EPA of the documents referred to in subparagraph A.2.a above, the balance of the escrow account shall be paid to Plaintiffs as provided in Paragraph D below. If such deadlines are met, the balance of the escrow account may, upon granting of the permissive waiver referenced in subparagraph A.2.3 immediately above, be paid to the Trustee(s) of the ETF on behalf of Settling Defendants.

5. Time Limitation. Stipulated penalties due hereunder shall be deemed waived if notice is not given by the Plaintiffs pursuant to Paragraph C below within one year of the deadline for an action that has been missed or other violation giving rise to the penalty has occurred. This limitation shall not apply if Settling Defendants have failed to report a missed deadline or other violation giving rise to a stipulated penalty in the reports submitted pursuant to Section XII above.

6. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Decree, except that Plaintiffs are collectively entitled to no more than one penalty per violation.

B. Accrual Dates. Except as provided in Paragraph E below, all stipulated penalties begin to accrue on the day following the day that complete performance for each item specified in paragraphs A.1 and A.2 is due, and continue to accrue through the final day of correction of the noncompliance or completion of performance. Payment of stipulated penalties shall not alter in any way Settling Defendants' obligations to complete performance. Any modification of the time for submitting reports or accomplishing major milestones that are subject to Stipulated Penalties under paragraphs A.1 and A.2 above shall be in writing and approved by EPA.

C. Notice. Following the Plaintiffs' determination that Settling Defendants have failed to comply with the requirements of this Decree, Plaintiffs shall give Settling Defendants written notice of said claim and provide a description of the alleged noncompliance, including the portion of Work or Additional Work affected and the date of noncompliance. This notice shall also indicate the amount of stipulated penalties allegedly due.

D. Payment. All stipulated penalties owed to the Plaintiffs under this Section shall be payable within thirty (30) days of receipt of written demand, unless Settling Defendants seek resolution of the dispute under Section XIV above. Penalties shall

accrue from the date of violation regardless of whether EPA has notified Settling Defendants of a violation. Interest shall begin to accrue on the unpaid balance of any specific penalty at the end of the thirty (30) day period for that penalty. One half of all stipulated penalties owed shall be paid to the United States, and the other half shall be paid to the State of Indiana, as described below. Such payments shall include a reference "Enviro-Chem #30" and the docket number of this case: All payments shall be mailed or wired to U.S. EPA Region V, Attn: Superfund Accounting; P.O. Box 70753; Chicago, Illinois 60673 (with copies to the federal addressees shown in Section XXII) and to the Indiana Department of Environmental Management, Attn: Cashier, 105 S. Meridian St., Indianapolis, Indiana 46206-6015, respectively.

E. Disputes. During any dispute resolution proceeding pursuant to Section XIV, penalties shall accrue, with interest, but need not be paid during the dispute resolution period. If a Court becomes involved in the resolution of the dispute, the period of dispute shall end and the accrual of penalties shall cease, upon the rendering of a decision by the District Court regardless of whether any Party appeals such decision. If Settling Defendants prevail upon resolution, Settling Defendants shall pay only such penalties as the resolution requires. If the Settling Defendants do not prevail upon resolution, the United States and the State have the right to collect all penalties which accrue during the period of dispute. The Settling Defendants shall, however, have the right to petition the Court for a finding that the Settling

Defendants' position regarding the dispute had substantial support in law, fact and/or expert opinion (as applicable) and reasonably could have been expected to prevail, in light of the applicable standard of judicial review, and that Settling Defendants sought resolution of the dispute at the earliest practicable time and took all other appropriate steps to avoid any delay in the Work as a result of the dispute. If the Court so finds, the Court may reduce the stipulated penalties as appropriate. Settling Defendants shall have the burden of proof and persuasion on any petition for reduction of stipulated penalties submitted hereunder.

F. Choice of Penalties. Nothing herein shall preclude EPA from bringing an action in this Court pursuant to Section 109 of CERCLA for any failure or refusal to comply with the provisions of this Decree. The United States may elect, in its sole discretion, whether to seek stipulated penalties under this Section or to seek civil penalties under Section 109 of CERCLA for a particular violation of the Decree, but agrees not to seek both types of penalties for the same violation. The United States and the State are precluded from seeking double payment of penalties by requiring that stipulated penalties be paid to one plaintiff and civil penalties to the other for the same violation.

G. Effect of Notice. The filing of a written notice of a dispute shall not alter in any way the Settling Defendants' obligations to complete the activities required of them under this Decree.

H. Pursuant to 31 U.S.C. § 3717, interest shall accrue on any amounts overdue at a rate established by the Department of Treasury for any period after the date of billing. A handling charge will be assessed at the end of each 30 day late period, and a six percent per annum penalty charge will be assessed if the penalty is not paid within 90 days of the due date.

XVIII.

COVENANT NOT TO SUE SETTLING DEFENDANTS

A. In consideration of actions which will be performed and payments which will be made by the Settling Defendants under the terms of the Decree, and except as otherwise specifically provided in this Decree, the United States and the State covenant not to sue or take administrative action against the Settling Defendants or their officers, directors, employees, or agents for Covered Matters. Covered Matters shall include any and all claims available to Plaintiffs under Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607, and Section 7003 of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6973, and any and all claims available to the State under Indiana statutes, regulations and common law nuisance, relating to the Facility. With respect to future liability, this covenant not to sue shall take effect upon certification by EPA of the completion of the remedial action concerning the Facility.

B. "Covered Matters" do not include:

(1) Liability arising from hazardous substances removed from the Facility;

(2) Criminal liability;

(3) Claims based on a failure by the Settling Defendants to meet the requirements of this Decree;

(4) Any matters for which the United States or the State is owed indemnification under Section XX hereof; and

(5) Liability for violations of Federal or State law which occur during implementation of the remedial action.

C. Notwithstanding any other provision in this Decree, (1) the United States reserves the right to institute proceedings in this action or in a new action or to issue an Order seeking to compel the Settling Defendants to perform any additional response work at the Facility, and (2) the United States and the State reserve the right to institute proceedings in this action or in a new action seeking to reimburse the United States for natural resource damages and for its response costs and to reimburse the State for its matching share of any response action undertaken by the EPA under CERCLA, relating to the Facility, if:

a. For proceedings prior to EPA certification of completion of the remedial action concerning the Facility,

(i) conditions at the Facility, previously unknown to the United States, are discovered after the entry of this Decree, or

(ii) information is received, in whole or in part, after the entry of this Decree,

and these previously unknown conditions or this information indicates that the remedial action is not protective of human health and the environment, and

b. For proceedings subsequent to EPA certification of completion of the remedial action concerning the Facility,

(i) conditions at the Facility, previously unknown to the United States, are discovered after the certification of completion by EPA, or

(ii) information is received, in whole or in part, after the certification of completion by EPA,

and these previously unknown conditions or this information indicates that the remedial action is not protective of human health and the environment.

D. Notwithstanding any other provision in this Decree, the covenant not to sue in this Section shall not relieve the Settling Defendants of their obligation to meet and maintain compliance with the requirements set forth in this Decree, including the conditions in the amended ROD, which are incorporated herein, and the United States and the State reserve their rights to take response actions at the Facility in the event of a breach of the terms of this Decree and to seek recovery of response costs incurred after entry of the Decree (1) relating to any portion of the Work funded or performed by the United States or the State; and/or (2) incurred

by the United States or the State as a result of having to seek judicial assistance to remedy conditions at or adjacent to the Facility.

E. Nothing in this Decree shall constitute or be construed as a release or a covenant not to sue regarding any claim or cause of action against any person, firm, trust, joint venture, partnership, corporation or other entity not a signatory to this Decree for any liability it may have arising out of or relating to the Facility. Plaintiffs expressly reserve the right to continue to sue any person, other than the Settling Defendants, in connection with the Facility.

XIX.

SPECIAL PROVISIONS FOR PREMIUM SETTLING DEFENDANTS AND SETTLING GOVERNMENT AGENCIES

A. Covenants Not to Sue. Except for those claims reserved in Paragraph C below, the Plaintiffs covenant not to sue Premium Settling Defendants and Settling Government Agencies with regard to any liability that could be imposed upon any of the Premium Settling Defendants and Settling Government Agencies as to any obligations or liability at the ECC Site arising under Sections 106 or 107 of CERCLA, 42 U.S.C. §§ 9606 or 9607, and Section 7003 of RCRA, 42 U.S.C. § 6973, or under any State environmental statute, regulation or common law doctrine. This Paragraph does not provide a covenant not to sue any Premium Settling Defendant or Settling Government Agency who does not make timely payment of the amount

required from it by this Consent Decree or for any other person or entity not a Party to this Consent Decree.

B. Consideration. The covenants not to sue contained in Paragraph A above are given in consideration of the payment to the trust fund, established pursuant to Section V.B.2 and Exhibit D, by each Premium Settling Defendant and Settling Government Agency of the amount shown for that Premium Settling Defendant and Settling Government Agency. Each such payment includes a premium amount in consideration of the covenants not to sue given to such Premium Settling Defendant as provided herein. The Premium Settling Defendants and the Settling Government Agencies, other than the United States Navy, shall be entitled to the contribution protection provided for in Section 122(g)(5) of CERCLA for matters addressed by this Consent Decree. The United States Navy shall be entitled to the contribution protection provided for in Section 113(f)(2) of CERCLA for matters addressed by this Consent Decree.

C. Reservation. The covenants not to sue contained in Paragraph A above shall not apply to any claim or demand for personal injury, third-party property damage (not including natural resource damages), "toxic tort" claims of any kind, or criminal liability, if any.

D. Certification. Each Premium Settling Defendant and Settling Government Agency hereby certifies that, based on information currently available to it and to the best of its knowledge and belief, it is aware of no facts indicating that its volumetric contribution of hazardous substances or contaminants to

the Facility was higher than the amount attributed to it in Exhibit D.

E. Covenants Null and Void. If it is ever shown that the volume attributed to a Premium Settling Defendant or Settling Government Agency is materially greater than the amount shown in Exhibit D, then the covenant not to sue provided in Paragraph A above shall be null and void as to such Premium Settling Defendant or Settling Government Agency, and such Defendant shall be subject to all the requirements and obligations of Settling Defendants set forth in this Decree.

F. Agreement to Terms of Trust Fund. Each Premium Settling Defendant and Settling Government Agency agrees to abide by the terms of the ECC 468B Trust Fund Agreement.

G. Effective Date. The covenants not to sue provided in Paragraph A above shall become effective upon payment to the ECC 468B Trust Fund.

H. Notwithstanding the provisions of this Section, EPA may, through appropriate administrative process, proceed against the United States Navy pursuant to Section XVIII.C. This provision shall not create any rights in the Navy for contribution from the Settling Defendants. This provision shall not affect, limit, or create any rights, liabilities or obligations of or in any other person, whether a party to this Consent Decree or not.

I. No Other Obligations. Notwithstanding any other provision of this Decree, Premium Settling Defendants and Settling Government Agencies shall have no obligation or liability under

this Decree except as set forth or reserved in this Section XIX and Section V.B.2.

XX.

INDEMNIFICATION; OTHER CLAIMS

A. Settling Defendants agree to indemnify, save and hold harmless EPA, the State and/or their representatives from any and all liability arising out of the acts or omissions of Settling Defendants and/or their representatives in carrying out the activities required by this Decree. EPA and the State shall notify Settling Defendants of any such claims or actions promptly after receipt of notice that such a claim or action is anticipated or has been filed. EPA and the State agree upon request by Settling Defendants to notify the designated representative(s) of Settling Defendants to the extent practicable of developments in any such action and not to settle any such action without first providing them with an opportunity to participate.

B. EPA and the State are not to be construed as parties to, and do not assume any liability for, any contract entered into by Settling Defendants in carrying out the activities pursuant to this Decree. The proper completion of Exhibit A under this Decree is solely the responsibility of Settling Defendants and the Contractor as provided herein.

C. Settling Defendants waive their rights to assert any claims against the Hazardous Substances Superfund under CERCLA that are related to any past costs or costs incurred in the Work performed pursuant to this Decree, and nothing in this Decree shall

be construed as EPA's pre-authorization of a claim against the Hazardous Substances Superfund.

XXI.

FINANCIAL RESPONSIBILITY

Settling Defendants, or some of them, will provide financial assurance to ensure that sufficient assets exist to fund the Work or Additional Work. Such financial assurance shall be in the form of a performance bond or a financial assurance mechanism provided for under the State's RCRA regulations at 329 I.A.C. § 3-22. If less than all Settling Defendants provide such financial assurance, it is expressly understood and agreed by the Parties that such subset of Settling Defendants providing such financial assurance shall not thereby incur, as a result of providing such financial assurance, any additional obligation to fund or guarantee performance of the Work or Additional Work (if any) beyond the obligations set forth in this Decree and in the ECC Trust Fund.

XXII.

NOTICES

A. Whenever, under the terms of this Decree, notice is required to be given, a report or other document is required to be forwarded by one party to another, or service of any papers or process is necessitated by the terms hereof, such correspondence shall be directed to the following individuals at the addresses specified below:

As to the United States or U.S. EPA:

a. Regional Counsel
Attn: Attorney for ECC Site -5CS-TUB
U.S. Environmental Protection Agency
230 S. Dearborn Street
Chicago, IL 60604

b. Director, Waste Management Division
Attn: ECC Remedial Project Manager 5HS-11
U.S. Environmental Protection Agency
230 S. Dearborn Street
Chicago, IL 60604

c. Assistant Attorney General
Environment & Natural Resources Division
U.S. Department of Justice
10th & Pennsylvania Ave., N.W.
Washington, D.C. 20530

As to the State of Indiana:

a. Attorney General
State of Indiana
Attn: Attorney for ECC Site
Room 219 - State House
Indianapolis, IN 46204

b. Commissioner, Indiana Department of Environmental Management
Attn: ECC Project Coordinator
105 South Meridian Street
P.O. Box 6015
Indianapolis, IN 46206-6015

As to Settling Defendants:

a. Norman W. Bernstein
Shea & Gould
Suite 700
1775 Pennsylvania Ave., N.W.
Washington, D.C. 20006

b. Timothy L. Harker Kyle
The Harker Firm
Suite 310
2021 K Street, N.W.
Washington, D.C. 20006

XXIII.

CONSISTENCY WITH NATIONAL CONTINGENCY PLAN

The United States and the State agree that the Work and Additional Work, if properly performed as set forth in Section VI and VII hereof, are consistent with the provisions of the National Contingency Plan pursuant to 42 U.S.C. § 9605.

XXIV.

RESPONSE AUTHORITY

Nothing in this Decree shall be deemed to limit the response authority of the United States under 42 U.S.C. § 9604, or the State under the Environmental Management Act, IND. CODE § 13-7.

XXV.

COMMUNITY RELATIONS

Settling Defendants shall cooperate with EPA and the State in providing information to the public regarding the progress of remedial design and remedial action at the Facility. As requested by EPA or the State, Settling Defendants shall participate in the preparation of all appropriate information disseminated to the public and in public meetings which may be held or sponsored by EPA or the State to explain activities at or concerning the Facility.

XXVI.

EFFECTIVE AND TERMINATION DATES

A. This Decree shall be effective upon the date of its entry by the Court.

B. Certification of Completion of Remedial Action:

1. Application. When Settling Defendants believe that the demonstration of compliance with the Work or Additional Work has been made in accordance with this Decree, they shall submit to the United States a Notification of Completion of Remedial Action and a final report which summarizes the work done, any modification made to the Work or Additional Work thereunder relating to the Cleanup Standards, and data demonstrating that Work or Additional

Work has been accomplished. The report shall include or reference any supporting documentation.

2. Certification. Upon receipt of the Notice of Completion of Remedial Action, EPA shall review the final report and any other supporting documentation, and the remedial actions taken. EPA shall issue a Certification of Completion of Remedial Action upon a determination that Settling Defendants have demonstrated satisfactory completion of the Work or Additional Work which certification shall not be unreasonably withheld. Nothing herein shall preclude EPA from certifying that any portion of the Work has been completed as required hereunder; provided, however, that EPA is not required to provide any such partial certification.

C. Termination. Upon the filing of EPA's Certification of Completion pursuant to the preceding paragraph, and a showing that the other terms of this Decree (other than the post-termination obligations referred to below), including payment of all costs and stipulated penalties due hereunder, have been complied with, the Work and Additional Work provisions of this Decree shall be terminated upon motion of any of the Parties. However, Settling Defendants' obligations to maintain the cap required by Work and any operation and maintenance required by Additional Work, shall survive the termination of said provisions and shall be enforceable by the United States by re-institution of this action.

XXVII.

NON-ADMISSIONS

Settling Defendants deny any liability with respect to any claim arising out of or related to the ECC Site or operation of the ECC Facility. By entering into this Decree and performing the Work or Additional Work hereunder, Settling Defendants do not admit any liability with respect to any claim arising out of related to the ECC Site or operation of the ECC Facility. This Decree shall not be admissible as evidence against any Settling Defendant on any question of law or fact in any proceeding, except that it shall be admissible by any Party hereto in a proceeding before this Court to implement or enforce the terms thereof against any other Party.

XXVIII.

RESERVATION OF RIGHTS

Settling Defendants, their agents, successors and assigns reserve all rights and defenses that they may have under the law with respect to (1) any claim of the United States or the State that is not barred by the Covenant Not To Sue hereunder, and (2) any claim of any person or entity not a Party to this Decree.

XXIX.

EFFECT OF SETTLEMENT/CONTRIBUTION PROTECTION

A. This Decree was negotiated in good faith by the Plaintiffs and Settling Defendants. The Settling Defendants shall be entitled to the contribution protection provided for in Section 113(f)(2) of CERCLA for matters addressed by this Consent Decree. The settlement reached among the Settling Defendants, Premium

Settling Defendants and Settling Government Agencies was reached at arm's length and is in good faith, is a fair settlement of the alleged liability of the Settling Defendants, Premium Settling Defendants and Settling Government Agencies and is in the public interest.

B. Settling Defendants agree that if any claim for contribution or indemnity is brought against them, individually or collectively, the named Settling Defendant(s) will timely notify Plaintiffs of the institution of that claim. If Settling Defendants individually or collectively bring a claim for contribution against any person, they will timely notify Plaintiffs of the institution of that claim.

C. Settling Defendants and Premium Settling Defendants covenant not to sue the Settling Government Agencies regarding matters addressed in this settlement, or the matters addressed in Section XIX.H.

D. Nothing in this Decree shall be construed to require any payment by the Settling Government Agencies in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341; provided, however, that if a Settling Government Agency does not make any payment required by this Decree or the Trusts established hereunder, it shall not be entitled to the contribution protections and covenants of this Decree.

ENTERED this _____ day of _____, 1991.

_____
U.S. District Judge

The Parties whose signatures appear below hereby consent to the terms of this Decree. The consent of the United States is subject to the public notice and comment requirements of Section 122(i) of CERCLA and 28 C.F.R. § 50.7 and the consent of all Parties is conditional upon the EPA adopting an amended ROD consistent with the proposed amended ROD lodged with this Decree.

By: _____

Richard B. Stewart
Assistant Attorney
General
Environment and Natural Resources
Division
U.S. Department of Justice
Washington, D. C. 20530

Date: 2-27-91

By: _____

Samuel B. Boxerman
Environmental Enforcement
Section
United States Department
of Justice
Washington, D.C. 20530

Date: 2/8/91

By: _____

Valdas V. Adamkus
Regional Administrator
U.S. EPA Region V

Date: 12/27/89.

STATE OF INDIANA

By: _____

Kathy Prosser
Commissioner, Indiana
Department of
Environmental Management

Date: 12-18-89

APPROVED FOR LEGALITY AND FORM

LINLEY E. PEARSON
Attorney General of Indiana

By: _____
Deborah E. Albright
Deputy Attorney General

DATE: 10-16-89

FROM CONSENT DECREE entered 9/20/91

EXHIBIT A

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXHIBIT A

1.0 INTRODUCTION

This document is a Remedial Action Plan (hereafter, "Remedial Action Plan", "RAP", "Exhibit A" or the "Document") and describes the work to be performed by the Settling Defendants at the Environmental Conservation and Chemical Corporation ("ECC") Superfund site as required by the attached Consent Decree ("Consent Decree" or "Decree"). This document is attached as Exhibit A to, and is incorporated by reference into and made an enforceable part of, that Decree.

The purpose of this Exhibit A is to set forth those remedial activities to be performed at the ECC site. The Settling Defendants under the Consent Decree ("Settling Defendants") shall arrange to have the work required hereunder performed by a Contractor or Contractors ("Contractor") in accordance with the requirements and specifications set forth herein.

The components of the RAP as presented herein are compatible with the proposed remedy for the adjacent Northside Sanitary Landfill (NSL) site. As the remedial design is finalized for the NSL site, the respective RAPs for ECC and NSL will be reviewed to ensure compatibility of design and construction schedules for each system. If any inconsistencies are identified, the Settling Defendants shall consult with those performing the remedy at NSL, and with EPA and the State to attempt to resolve any such inconsistencies.

2.0 REMEDIAL ACTION PLAN

2.1 Elements of the RAP

2.1.1 Soil Vapor Extraction, Concentration and Destruction

The objective of the soil vapor extraction activity is to remove and destroy VOCs and selected base neutral/acid organics from the soils (as provided herein).

By systematically and uniformly moving air through the zone of contamination, volatilization and hence removal of organics are accelerated. For the ECC site, air movement through the soil will be controlled by a network of vertical trenches installed throughout the zone of contamination. The process also involves the continuous extraction of organics-laden air from the trench system and treatment of the air by activated carbon to remove the organics. The organics so collected will then be destroyed off-site in conformance with applicable Federal and State requirements.

The effectiveness of vapor extraction for organics removal from the ECC soils was demonstrated during a pilot test conducted by Terra Vac, an environmental consulting firm, in June, 1988. The description of the pilot test, including the results obtained, was previously submitted to USEPA and the State of Indiana. The test showed an initial high organics extraction rate of 1.9 pounds per day per foot of trench that decreased over the course of the pilot test to a steady state rate of approximately 0.25 pounds per day per foot of trench. Although the Terra Vac pilot

study provides the foundation for the system designed herein for ECC, during the conceptual and preliminary engineering phase, several engineering and operational enhancements were developed which should improve overall performance and effectiveness of the vacuum extraction system to be implemented under this Remedial Action Plan. These system enhancements are the result of consultations among the following environmental consulting firms: ERM-North Central, Inc., Midwest Water Resource, Inc. (MWRI), and Terra Vac, Inc. A summary of the key improvements and the associated measures employed for this enhanced vapor extraction system are as follows:

- Reduction of surface water infiltration within the zone of treatment by construction of the Resource Conservation and Recovery Act (RCRA)-compliant (Subtitle C) cover system;

- Reduction in the volume of air required for effective remediation by reducing air infiltration into the vapor extraction system by constructing the RCRA-compliant (Subtitle C) cover;

- Reduction of atmospheric discharges of treated extraction air by reinjecting the air through a network of injection trenches installed as part of the vapor extraction system;

- Positive control (collection and removal) of subsurface* till water encountered in the zone of treatment by providing sufficient

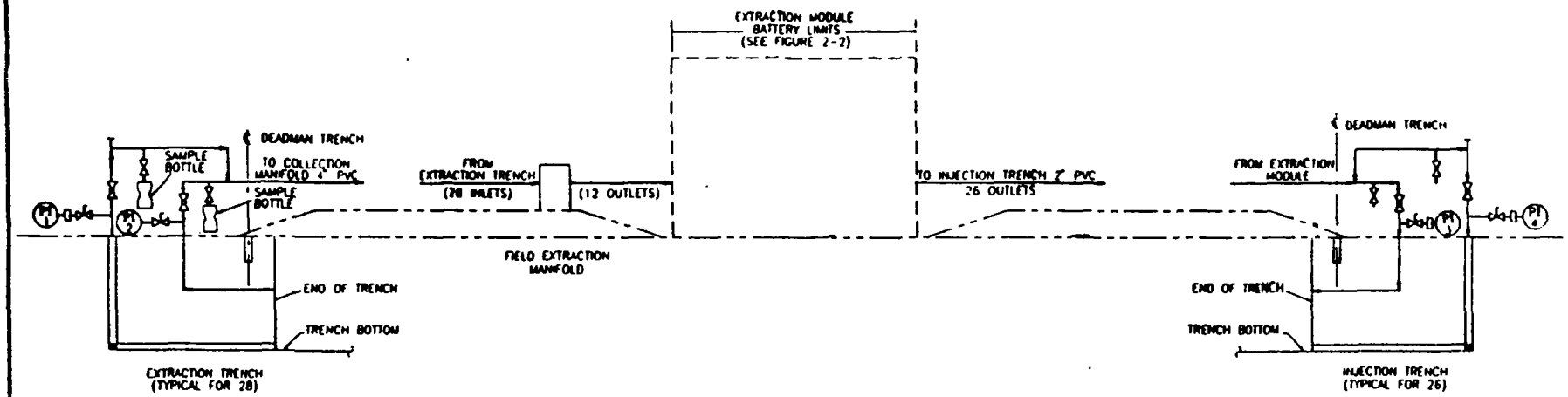
vacuum and/or supplemental air to remove water which accumulates in the extraction trenches; and

- o Essentially uniform horizontal movement of air through the zone of treatment resulting in enhanced contact between the air and the VOCs in the soil during operation of the soil vapor extraction system by utilizing a network of injection and extraction trenches in conjunction with the impervious cover provided by the RCRA-compliant (Subtitle C) cover system.

* For purposes of this document, "subsurface" water shall mean "ground water", as defined at 40 CFR 260.10.

The following discussion and drawings show concepts and details of the design and operation of the soil vapor extraction system.

The soil vapor extraction process is illustrated in Figures 2-1 and 2-2. The basic operation consists of extraction of air using a single vacuum pump from a network of 28 extraction trenches located throughout the site. Free liquid entrained in the air is removed by gravity in an entrainment separator. Periodically, water which accumulates in the entrainment separator is pumped to an on-site storage tank for subsequent transport to an off-site facility for treatment as necessary, in accordance with applicable Federal, State and local regulations. From the vacuum pump, air passes through the carbon adsorption system, which consists of two upflow carbon columns connected in series. Off-gases from the carbon adsorption system are withdrawn by a pump



SYMBOLS	
▷◁	BALL VALVE (FULLY PORTED)
PI	PRESSURE INDICATOR WITH DIAPHRAGM SEAL & SHUTOFF COCK
▷◁	GATE VALVE

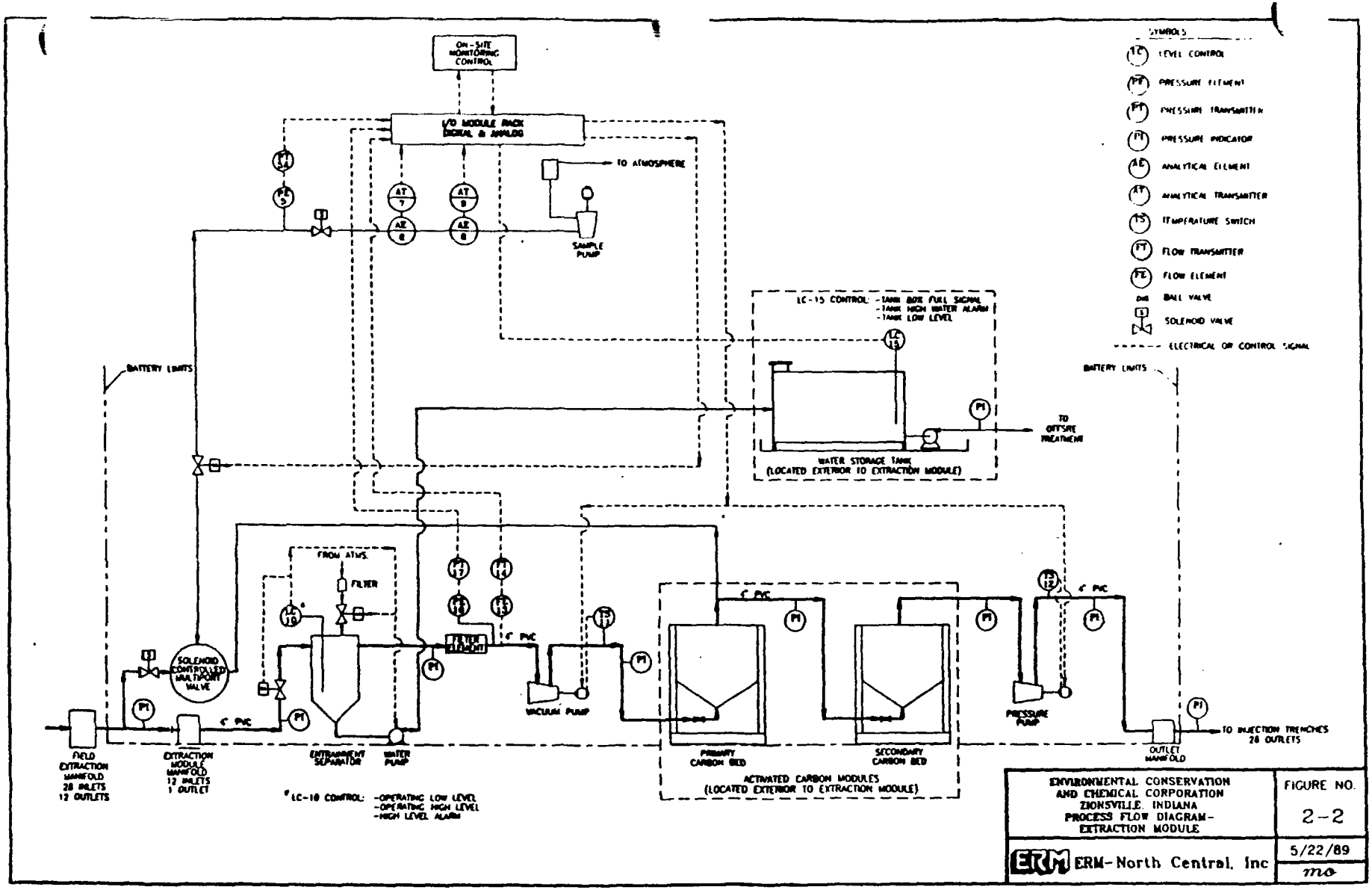
ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION
ZIONSVILLE, INDIANA
PROCESS FLOW AND INSTRUMENT DIAGRAM

FIGURE NO
2--1

ERM ERM-North Central, Inc.

6/23/89

CS



ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION ZIONSVILLE, INDIANA PROCESS FLOW DIAGRAM - EXTRACTION MODULE	FIGURE NO. 2-2
ERM-North Central, Inc	5/22/89 mo

which boosts the pressure and reinjects air into a network of 26 injection trenches located throughout the site. Each injection trench is located between and parallel to a pair of extraction trenches. The injected air then migrates from the injection trench through the soil towards the extraction trench. As the air migrates through the soil towards the extraction trench, the organics are vaporized into the air stream. As described in Section 2.1.2, the RCRA-compliant (Subtitle C) cover will be placed over the entire trench network to prevent air and water infiltration into the system during operation.

The major system components are:

- Extraction and injection trenches;
- Soil vapor extraction system;
- Water collection system;
- Carbon adsorption system;
- Air injection system; and
- RCRA-compliant (Subtitle C) cover.

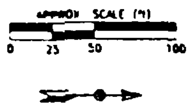
A description of the design and operational features of each of these components is presented below.

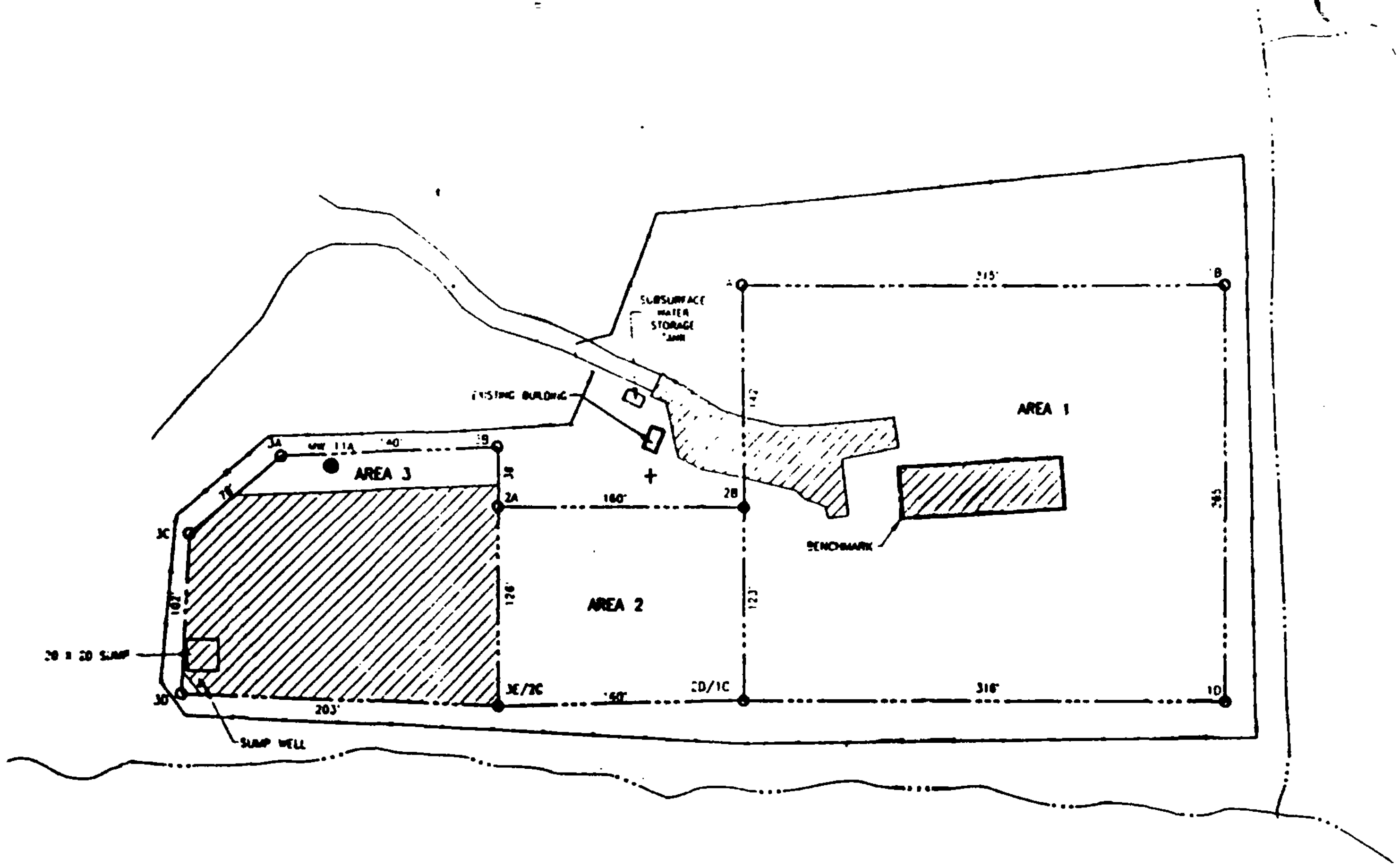
Extraction and Injection Trenches

The area where remedial activity will occur is depicted in Figure 2-3. The west boundary of Area 1 encompasses the area of ECC

LOCATION COORDINATES

POINT	N/S	E/W
1A	0+60 N	[illegible] W
1B	3+76 N	1+22 W
1C	0+60 N	1+42 E
1D	3+76 N	1+42 E
2A	1+00 S	0+20 E
2B	0+60 N	0+20 E
2C	1+00 S	1+46 E
2D	0+60 N	1+42 E
3A	2+38 S	0+11 W
3B	1+00 S	0+18 W
3C	2+98 S	0+39 E
3D	3+03 S	1+40 E
3E	1+00 S	1+46 E
MW 11A	2+08 S	0+06 W
SUMP WELL	2+86 S	1+34 E
BENCHMARK	1+62 N	3+37 E





LEGEND

- FENCE LINE
- BUILDING LINE
- PAVEMENT EDGES
- BOUNDARY LINES
- DRAINAGE DITCH
- CONCRETE
- BOUNDARY CORNER

+ REFERENCE POINT FROM CH M-HILL TECHNICAL DOCUMENT NO. 2 DATE 9/16/88 (921700 N; 725900 E)

NOTE: DRAINAGE DITCHES WEST AND SOUTH OF SITE ARE NOT SHOWN ON EXISTING SITE SURVEYS. THESE DITCHES WILL BE VERIFIED AND SHOWN ON FINAL "PLANS AND SPECIFICATIONS".

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION
ZIONSVILLE, INDIANA
REMEDIAL ACTIVITY AREA

FIGURE NO 2-3

7/21/89

ERM ERM-North Central, Inc.

activities that resulted in hazardous substances being released, as verified by an examination of aerial photographs, and coincides with a pre-existing earthen berm which formed the western boundary of ECC's water containment system for this area.

The layout and construction details for the network of 28 extraction trenches and 26 injection trenches are presented in Figures 2-4 and 2-5. Trench spacing will be 18 feet, and trench length varies depending on the configuration of the site. Construction details of extraction trenches and injection trenches are identical. By implementing minor above-ground piping changes, injection trenches can and will be utilized as extraction trenches. The work required under this Remedial Action Plan will initially involve using the original extraction trenches for extraction; at some point in the process, the extraction trenches will be converted to injection trenches, and vice versa, to ensure complete vapor extraction of the soil.

All trenches are to be a minimum of 9-feet deep as measured from existing grade, and will be backfilled with washed "float" stone. The trench width will be 12-15 inches. The bottom elevation for both injection and extraction trenches will be sloped at a minimum of 1/16-inch per foot to a low point located at the water collection pipe as noted in Section A-A of Figure 2-5.

Soil removed from the trench excavation will be spread over the surface of the facility prior to construction of the cover system and covered in accordance with the final RCRA-compliant (Subtitle C) cover detail illustrated in Figure 2-5. Soil removed from the trenches constructed in the areas of the concrete pad (Area 3) will be spread over the surface in Areas 1 and 2 with trench spoils from those areas.

SEQUENCE OF CONSTRUCTION ACTIVITIES:

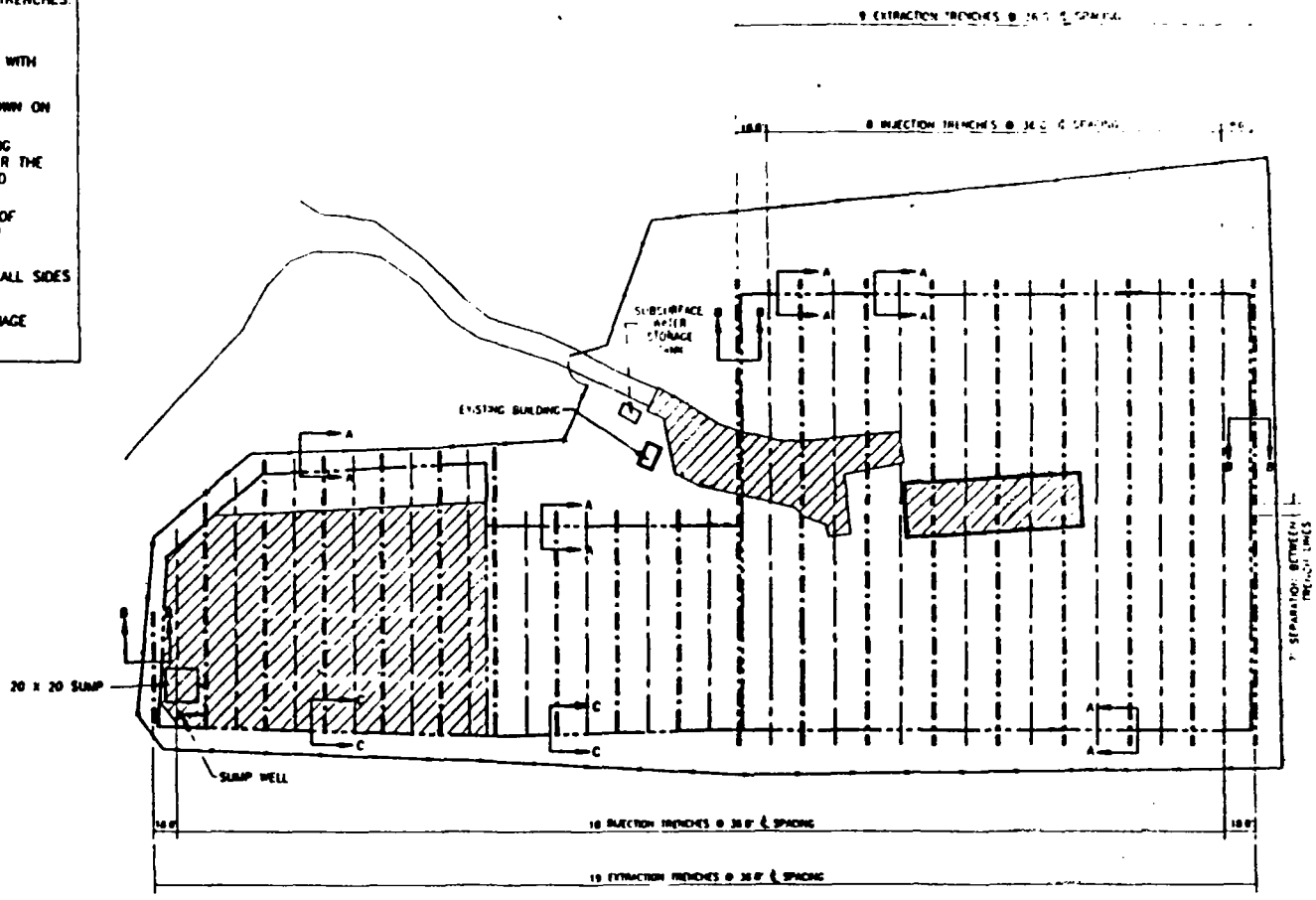
1. GRADE EXISTING TREATMENT SITE (AREA NOS. 1,2, & 3) TO EVEN SLOPE.
2. EXCAVATE INJECTION AND EXTRACTION TRENCHES.
3. FILL INJECTION TRENCHES WITH FLOAT STONE AS SHOWN ON FIGURE 2-5.
4. FILL EXTRACTION TRENCHES TO GRADE WITH FLOAT STONE AS SHOWN ON FIGURE 2-5.
5. EXCAVATE DEADMAN TRENCHES AS SHOWN ON FIGURE 2-6.
6. SOIL REMOVED FROM TRENCHES DURING CONSTRUCTION SHALL BE GRADED OVER THE SURFACE IN AREAS 1 AND 2 PRIOR TO INSTALLATION OF THE COVER SYSTEM.
7. COVER TREATMENT SITE WITH 1 FOOT OF NATIVE SOIL IN 6" LAYERS COMPACTED TO 95% PROCTOR DENSITY
8. COVER TREATMENT SITE WITH 60 mil HDPE PLASTIC MEMBRANE ANCHORING ALL SIDES IN DEADMAN TRENCH AS SHOWN ON FIGURE 2-5.
9. COVER TREATMENT SITE WITH 6" DRAINAGE LAYER OF SAND AS SHOWN ON FIGURE 2-5

APPROX SCALE (ft)

0 25 50 100

LEGEND:

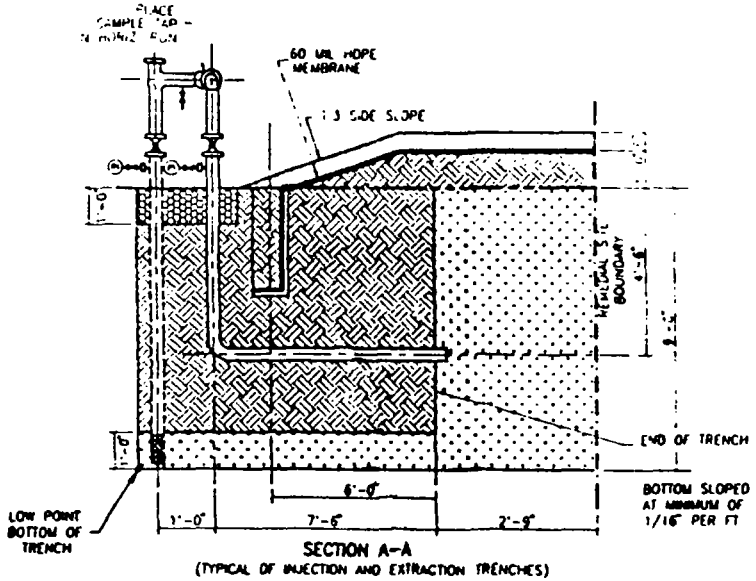
- FENCE LINE
- BUILDING LINE
- PAVEMENT EDGES
- BOUNDARY LINES
- INJECTION TRENCHES
- EXTRACTION TRENCHES
- CONCRETE



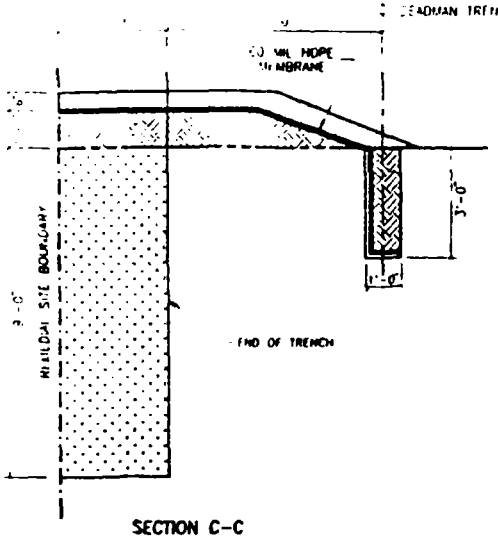
ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION ZIONSVILLE, INDIANA SOIL VAPOR EXTRACTION-TRENCH PLAN	FIGURE NO 2-1
ERM ERM-North Central, Inc	7/21/89

Each trench will be equipped at one end with a vapor extraction pipe and a water collection pipe as illustrated in Section A-A of Figure 2-5. Both pipes will be 4-inch diameter, Schedule 40 PVC. Each pipe segment will be equipped with pressure/vacuum indicator, isolating valve and sample tap. A "T" at the top of the water collection pipe will permit the future installation of air piping to air lift water from the trench network, if necessary. Individual 4-inch, Schedule 40 PVC pipes will be routed from each extraction trench to the extraction module. The extraction module will be located adjacent to the existing concrete pad near the site entrance. Alternatively, two or three extraction trenches will be manifolded together and conveyed to the extraction module via a 4-inch, Schedule 40 PVC pipe. Injection trench piping is identical to the extraction trench piping and, as previously described, will permit it to be utilized as an extraction trench during the operation of the vapor extraction system. To minimize field piping from the extraction module to the injection trenches, 4 to 8 injection trenches will be manifolded together. Four-inch, Schedule 40 PVC pipe will be used to convey air returned from the extraction module to the injection trench.

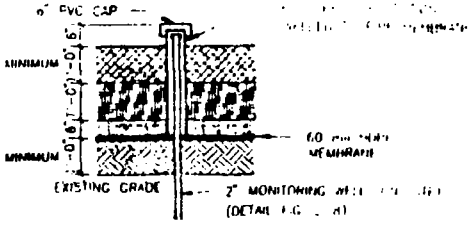
The Sump Well installed by EPA will be backfilled with the material used to backfill trenches (i.e, float stone) and a 4-inch PVC pipe will be installed between the Sump Well and the nearest extraction trench, thereby tying the Sump Well directly into the vapor extraction system. The existing 20 ft. x 20 ft. sump will be handled similarly, and will be dewatered prior to installing the RCRA-compliant (Subtitle C) cover system. All water removed from this sump will be handled in accordance with applicable Federal, State and local requirements.



SECTION A-A
(TYPICAL OF INJECTION AND EXTRACTION TRENCHES)

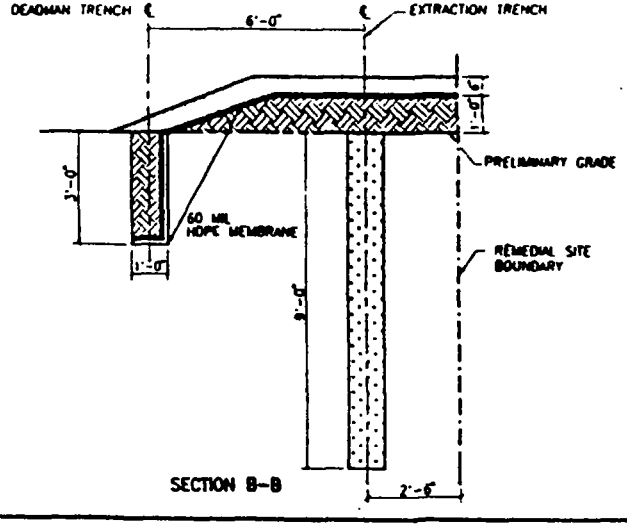


SECTION C-C

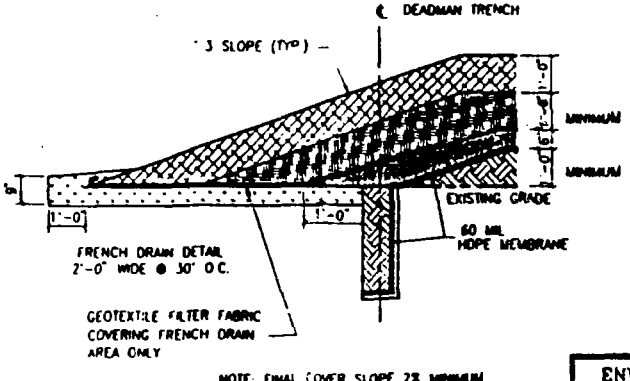


SAMPLING PORT DETAIL

NOTE SECTIONS REFER TO PLAN SHOWN IN FIGURE 2-4



SECTION B-B



NOTE: FINAL COVER SLOPE 2% MINIMUM. SEED WITH APPROPRIATE SEED MIXTURE OF GRASSES.

FINAL RCRA-COMPLIANT COVER

BENTONITE

MISC SOIL FILL

BACKFILL WASHED FLOAT STONE/GRAVEL

TOP SOIL

COMPACTED NATIVE SOIL

SAND COVER

NOTE NOT TO SCALE

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION ZIONSVILLE, INDIANA VAPOR EXTRACTION-TRENCH DETAIL	FIGURE NO 2-5
ERM ERM-North Central, Inc	7/21/89
	C.3

Soil Vapor Extraction System

The vacuum pump will have a nominal capacity of 500 standard cubic feet per minute (SCFM) and will be capable of developing a vacuum of 18 inches Hg. The normal operating vacuum is anticipated to be 12 inches Hg. Based on MWRI's experience with soils characteristic of the ECC site and on the Terra Vac pilot study results at the ECC site, the zone of influence at the operating vacuum will be at least 40 feet (20 feet either side of the trench). The pilot test results showed an initial radius of influence of 15 feet during trench development. Under continuous operation, the radius of influence increased to about 20 feet. The enhanced operating efficiency obtained by installing an impervious cover and injecting air will increase the radius of influence to over 20 feet. To be conservative, a spacing between trenches of 18 feet was selected.

The vacuum will be applied at the trench outlet and will be distributed throughout the entire length and vertical dimension of the trench. The highly porous backfill material used will assure this uniform distribution of vacuum throughout the extraction trench. The reinjection pressure of air in each adjacent injection trench will be approximately 37.4 inches Hg (1.25 atm). Therefore, the pressure differential and driving force for air movement between injection and extraction trenches under normal operating conditions is approximately 19.4 inches Hg (0.65 atm).

The selection of the design air volume of 500 SCFM is based upon MWRI's experience and is consistent with the Terre Vac pilot plant test results. The criteria established is to provide at

least one air volume change per soil pore volume per day. Based upon an area of treatment of 150,000 square feet, a depth of contamination of 9 feet, and a soil porosity of 10%, 500 SCFM exceeds the MWRI criteria by 400%.

The vapor extraction process will operate continuously and will shut down automatically only in the event of an operating problem or malfunction. The following are conditions which will shut down normal operating sequence of the vapor extraction system:

- High vapor temperatures above the estimated acceptable range of 150 to 180°F prior to activated carbon treatment;

- Low vapor temperatures below the estimated acceptable range of 75 to 85°F prior to activated carbon treatment indicating relative humidity above the estimated acceptable range;

- High water level in water entrainment separator indicating operating problems with liquid transfer operation;

- High water level in subsurface water storage tank;

- High or low pressure conditions on vacuum or injection pumps under normal operating conditions; and

- Power interruptions for the site.

During normal operation, vapor extraction will be stopped to facilitate carbon vessel change out as described later in this section and during transfer of water from the entrainment separator to the on-site subsurface water storage tank, or to conduct restart spike tests.

The air extracted from the system will be continuously monitored by in-line instrumentation as shown on the process flow diagram (Figure 2-2) and described on Table 2-1 (Instrument Summary Sheet). The capability will exist to sample individual trench exhausts or the combined air stream. Sample taps will be provided to collect vapor samples for detailed chemical analysis. The on-line instrumentation will consist of a photoionization detector (PID) and moisture analyzer. The vacuum pump, controls and instrumentation will be located in the Vapor Extraction Module Building.

Water Collection System

The high vacuum vapor extraction system selected will be capable of entrainment and movement of water which accumulates in the extraction trenches. Any free liquid in the extracted vapor will be separated by gravity in an entrainment separator located in the Vapor Extraction Module Building. A level control system will be utilized to control the removal of water which accumulates in the entrainment separator as required. The separator tank is equipped with a vacuum breaker system which will open the tank to the atmosphere to permit water to be transferred by pump from the separator to an on-site water storage tank as necessary. The time required to make this transfer will depend upon the equipment supplied by the vapor

TABLE 2-1
ERM-NORTH CENTRAL, INC.
INSTRUMENT SUMMARY SHEET

CLIENT: Environmental Conservation and Chemical Corporation

PROJECT NO.: 9041

DATE: 2/28/89 REVISED: 5/23/89

TAG NO.	SERVICE	REFERENCES MOUNTING PANEL	MOUNTING FIELD	SPEC SHEET	FLOW DIA.
PI	Pressure Indicator		X		2-1 2-2
PI-1 thru PI-4	Pressure Indicator with diaphram Seal and shutoff cock		X		2-1
PE-5	Pressure sensing element				
PT-5A	Pressure transmitter		X		2-2
AE-6	Moisture sensing element		X		2-2
AT-7	Moisture transmitter	X			2-2
AE-8	Volatile organics detector and quantifier	X			2-2
AT-9	Volatile organics quantified signal transmitter	X			2-2
LC-10	3-point water level control and alarm		X		2-2
TS-11	Gas temperature sensor with high level system shutdown switch		X		2-2
TS-12	Gas temperature sensor with high level system shutdown switch		X		2-2
FE-13	Gas flow measuring element		X		2-2
FT-14	Gas flow signal transmitter		X		2-2
LC-15	3-point water level control and alarm		X		2-2
PE-16	Pressure sensing element		X		2-2
PT-17	Pressure transmitter		X		2-2

extraction system vendor selected.

The size of the storage tank will be sufficient to store the liquids, considering the off-site handling/treatment option selected. If water collected from the soil vapor extraction system is to be discharged to the Northside Sanitary Landfill (NSL) pipeline, a 1,000-gallon storage tank will be used; or if water collected is to be hauled off-site by tank truck for disposal, a 10,000-gallon tank will be used. The tank will be equipped with level measurement and control to advise operating personnel to the status of liquid accumulation in the storage tank. Periodically, the contents of the water storage tank will need to be removed. The removed water will either be sent to the Indianapolis POTW via the NSL pipeline or truck, or to another off-site facility for handling and treatment as necessary, in accordance with applicable Federal, State and local regulations.

Carbon Adsorption System

From the water entrainment tank, the air passes through a particulate filter preceding the vacuum pump. The pressure drop across the filter will be monitored and used as the signal for determining servicing of the filter element. The exhaust from the vacuum pump will be piped directly to a two-stage carbon adsorption system (primary and secondary). This system will consist of two vessels in series each containing approximately 1,800 pounds of granular activated carbon. The organics contained in the extracted air will be adsorbed on the activated carbon. The moisture content of the air stream will be less than 50% relative humidity and temperatures will be approximately 150°F, both acceptable for efficient operation of carbon

adsorption.

During the initial phases of operation, when organics concentrations in the air stream will be highest, the carbon capacity for the organics is expected to be about 25% by weight. During the latter phases of remediation as organic concentration of vapor decreases, the projected carbon capacity for organics will range between 10-15% by weight. Based upon an assumed total mass of organics of about 5,000 pounds (Appendix A), the total quantity of activated carbon required for the entire remediation program is 25,000 pounds. This equates to fourteen 1800-pound carbon vessels for the entire program. The actual amount of carbon used will depend upon the total mass of organics extracted during operation of the soil vapor extraction system and the carbon adsorption capacity.

The vapor from the primary carbon vessel will be monitored frequently (approximately once per hour) by an on-line PID analyzer. When the PID analyzer detects organic vapor in the air stream between the primary and secondary carbon vessels, the vacuum extraction system will shut down automatically to permit the removal and replacement of the "spent" primary carbon vessel. An operator will be alerted to this condition, and will disconnect the primary carbon bed from service. The spent carbon vessel will be removed and replaced by a carbon vessel containing fresh activated carbon. The unit previously serving as the secondary carbon bed will become the primary carbon bed and the unit just placed in operation will be the secondary carbon bed. Once this switch is complete, the soil vapor extraction system (i.e., vacuum pump and injection pump) will be restarted, and the system operation resumed. The arrangement of two activated carbon vessels in series (i.e., primary and secondary) will

permit optimal utilization of the activated carbon, and efficient capture of the organics.

The spent carbon vessels will be stored on-site. The vessels will be stored on the existing concrete pad adjacent to the vapor extraction module building, inside the fenced area. An approximate location of this area is shown in Figure 2-4. The inlet and outlet connections to each vessel will be capped and sealed appropriately. Periodically when a truckload quantity of vessels has accumulated, and at the conclusion of the vacuum extraction program, the vessels containing the spent carbon will be transported in accordance with applicable Federal, State and local requirements to an off-site facility where the carbon will be regenerated by high temperature incineration, and in the process, the organics adsorbed on the carbon will be destroyed.

Air Injection System

The exhaust air from the secondary carbon bed will be piped to the injection pump located in the extraction module building. The injection pump will be capable of delivering 500 SCFM at 10 psig (1.65 atm). The discharge from the injection pump will be distributed to the 26 injection trenches via a system of manifolds. Control of the injection pump will be interlocked with the vacuum extraction pump. The pipe at each injection trench will be equipped with a pressure/vacuum gauge so that injection pressure at the trench can be periodically monitored.

During the soil vapor extraction program, the injection trenches will be utilized as extraction trenches and vice versa. This can be accomplished by minor above ground manifold piping modifications. It is also planned that as the Cleanup Standards

set forth in Table 3-1 below are met for individual trench "areas", the corresponding extraction and injection trenches will be isolated from the extraction and injection operation by closing the shut off valves located at each trench. This will permit the soil vapor extraction system to concentrate on any remaining areas which have not fully achieved the Cleanup Standards specified in Table 3-1, thereby accelerating cleanup of those areas.

RCRA-Compliant (Subtitle C) Cover

The operation of the vapor extraction system will be enhanced by the installation of the RCRA-compliant (Subtitle C) cover over the entire site. Details and a schedule for installation of the final RCRA-compliant (Subtitle C) cover are presented in Section 2.1.2.

Miscellaneous

- Each extraction trench is equipped with two sample taps, one on the vacuum pipe and one on the water collection pipe. Each of these taps can be fitted with a sample bottle for the collection of free moisture.

- Electrical service required for the site remediation work is anticipated to be 3-phase 460 volt. Total electrical demand will be approximately 100 KVA. Power distribution will be to the extraction module building. Operating voltage for the extraction and injection pumps is anticipated to be 460

volts. A 110 volt supply will be provided for miscellaneous site lighting, equipment, instrumentation and controls. Power distribution to any site construction and office trailers will also be provided.

- Prior to construction of the trenches, the following activities will be conducted:

  1. The existing buildings within the area currently fenced will be demolished and properly disposed of off-site;

  2. The existing tanks removed and properly disposed of off-site; and

  3. The site will be graded to fill existing depressions and to eliminate any sharp grade changes.

2.1.2 RCRA-Compliant (Subtitle C) Cover

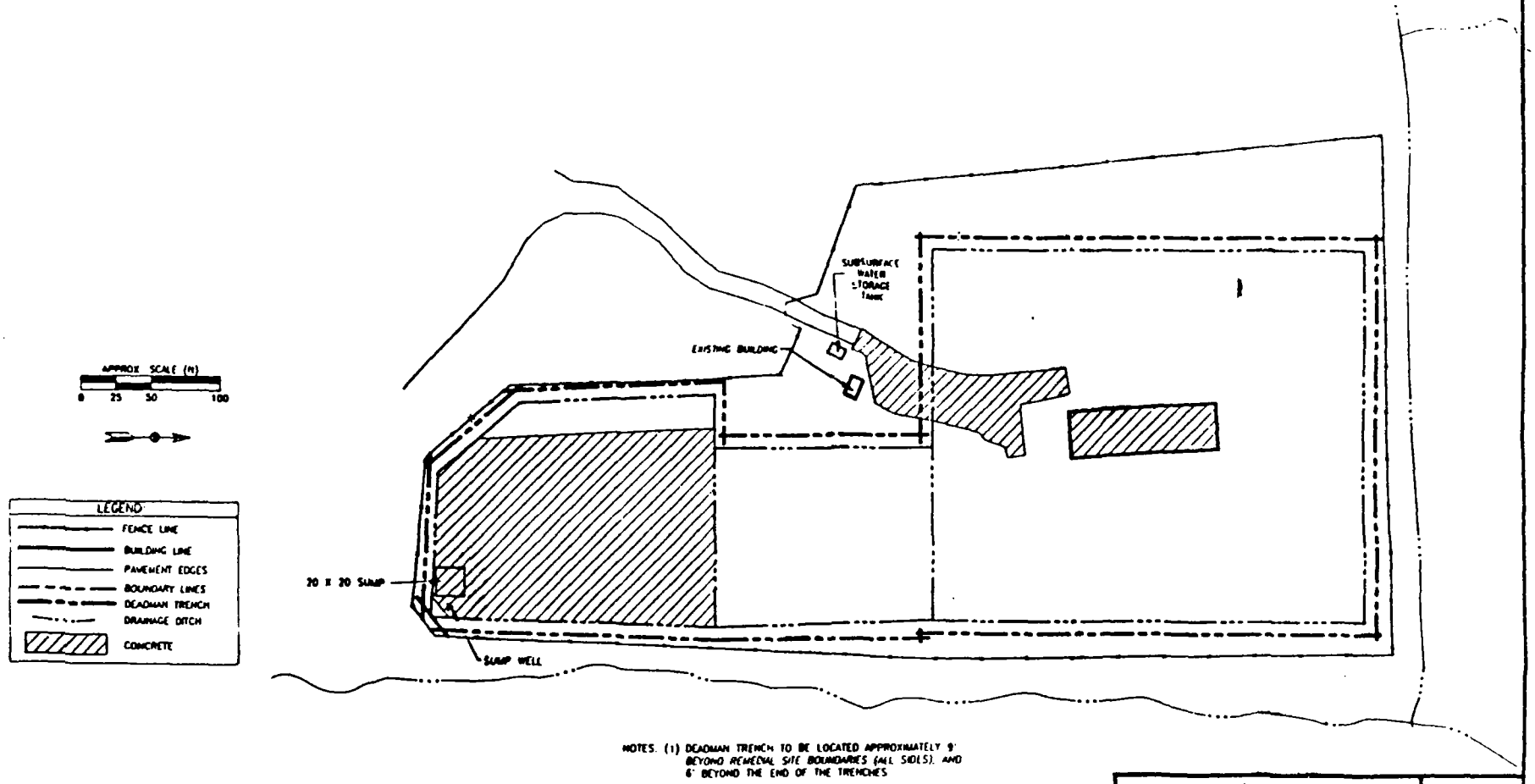
The RCRA-compliant (Subtitle C) cover illustrated in Figure 2-5 will consist of a minimum of 1-foot of compacted, highly impermeable native soil, a continuous welded 60 millimeter high density polyethylene (HDPE) plastic membrane, a minimum 6-inch layer of compacted sand for drainage, 1 to 3 feet of miscellaneous soil/fill material and 1 foot of top soil to support vegetation. The final grading plan will ensure a minimum slope of 2%. The native soil used will be the silty clay till available in the area, which can and will be compacted by

standard methods to 95% proctor density. If soil from the neighboring NSL Facility borrow area is not available, material with similar performance will be obtained by Settling Defendants from another source.

To provide a perimeter seal of the HDPE membrane, a 1-foot wide, 3-foot deep "deadman trench" will be installed around the site boundary (Figure 2-6). The HDPE membrane will be draped into this trench. The trench will then be backfilled and compacted with native soil (silty clay till) to 95% proctor density. The cover will extend approximately 6 feet beyond the deadman trench as noted on Figure 2-6 and detailed on Figure 2-5.

As previously described, the material excavated from the trenches will be graded uniformly throughout trench areas 1 and 2 and incorporated into the top layer of existing surface soil prior to the construction of the RCRA-compliant (Subtitle C) cover as shown in Figure 2-5.

The RCRA-compliant (Subtitle C) cover will be installed over the entire site, including the concrete pad. Prior to operation of the soil vapor extraction system, the following components of the RCRA-compliant (Subtitle C) cover will be installed: (1) 1-foot minimum compacted native soil; (2) a 60 mil HDPE membrane; and (3) 6 inches of sand. Prior to installation of the remaining components of the cap, Settling Defendants shall ensure that the aforesaid components of the cap meet the aforesaid specifications. The remaining components (1-foot minimum miscellaneous soil/fill, 1-foot minimum topsoil and appropriate vegetation) will then be installed in accordance with the schedule presented in Section 5.0. At completion of the soil vapor extraction program all surface piping will be removed from



NOTES. (1) DEADMAN TRENCH TO BE LOCATED APPROXIMATELY 9' BEYOND REMEDIAL SITE BOUNDARIES (ALL SIDES), AND 6' BEYOND THE END OF THE TRENCHES

(2) DEADMAN TRENCH DEFINES THE BOUNDARY OF THE HDPE LINER THE RCRA-COMPLIANT (SUBTITLE C) COVER DETAIL EXTENDS APPROXIMATELY 6' BEYOND THE DEADMAN BOUNDARY AS SHOWN ON FIG 2-5

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION ZIONSVILLE, INDIANA DEADMAN TRENCHING PLAN	FIGURE NO 2-6
ERM ERM-North Central, Inc	7/19/89
	CA

the site in addition to any equipment, buildings or trailers. At that time the extraction and injection trench piping may be cut off at the current grade, filled with grout, and covered with a minimum of 1 foot of topsoil, which will be vegetated. Vegetation which will be established shall include fibrous, shallow, laterally growing roots, such as grass (which may include red fescue and Kentucky blue grass).

The Settling Defendants shall conduct periodic inspections and shall repair the cap as necessary to ensure its integrity in accordance with the time periods set forth in 40 CFR Sections 265.117 and .118 or 329 I.A.C. Sections 3-21-8 and -9.

2.1.3 Access Restrictions

Access restrictions to be implemented by the Settling Defendants will consist of a fence around the site perimeter and the posting of warning signs. In addition, Settling Defendants will use "best efforts", as that term is used in Section X A. of the Decree, to have recorded appropriate restrictions with the County Recorder's Office prohibiting: (a) usage of the site for excavation and development; (b) usage of ground water from the saturated till and the underlying sand and gravel; and (c) installation of new water wells other than monitoring wells.

2.1.4 Subsurface and Surface Water Monitoring

The monitoring activities will:

- Detect the presence of the VOCs, base neutral/acid organics, PCBs, and heavy metals

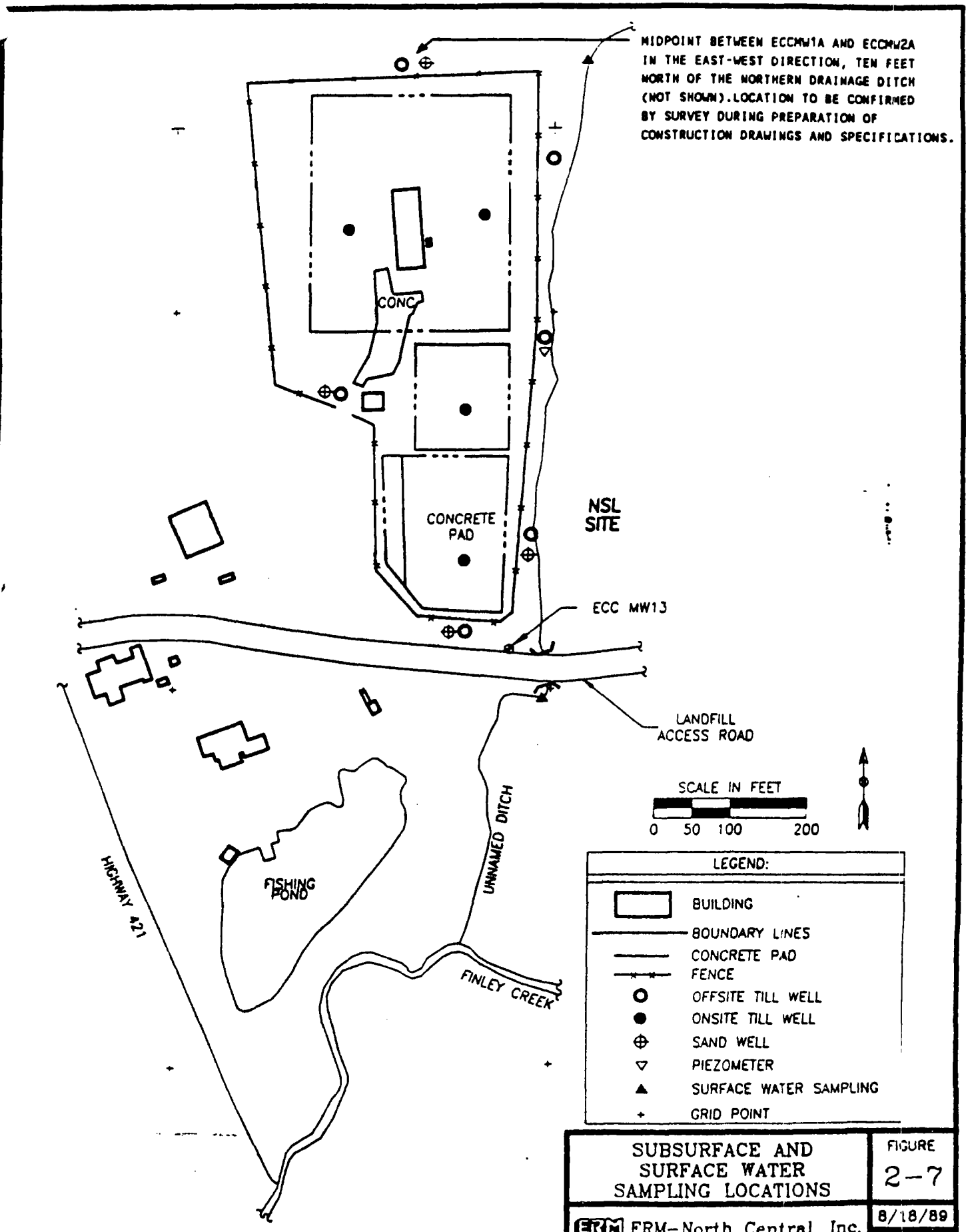
specified in Table 3-1 in the subsurface and surface water during and after vapor extraction; and

- Provide information to determine the effectiveness of the soil vapor extraction program.

Two types of subsurface water monitoring systems will be installed under this Remedial Action Plan. The first is an on-site till monitoring system consisting of four wells screened in the saturated zone of the till. The location of these on-site till wells is shown in Figure 2-7. Sampling results from the on-site till wells will be compared to the Acceptable Subsurface Water Concentrations in Table 3-1 or the Applicable Subsurface Water Background Concentrations of Table 3-1 ("Applicable Subsurface Water Background Concentrations").

Samples from the on-site till monitoring wells will be collected at the beginning of the soil vapor extraction operation and quarterly thereafter until completion of the soil vapor extraction program. Monitoring will be continued on a semi-annual basis as specified in Section 4.0. Every time samples are collected from the on-site wells, the soil vapor extraction system will be shut down to allow water, if any, to stabilize within the till. Samples collected from the on-site wells will be analyzed for those parameters listed under Acceptable Subsurface Water Concentrations in Table 3-1.

The second type of subsurface water monitoring system consists of off-site wells screened in the till and offsite wells screened in



SUBSURFACE AND SURFACE WATER SAMPLING LOCATIONS

FIGURE 2-7

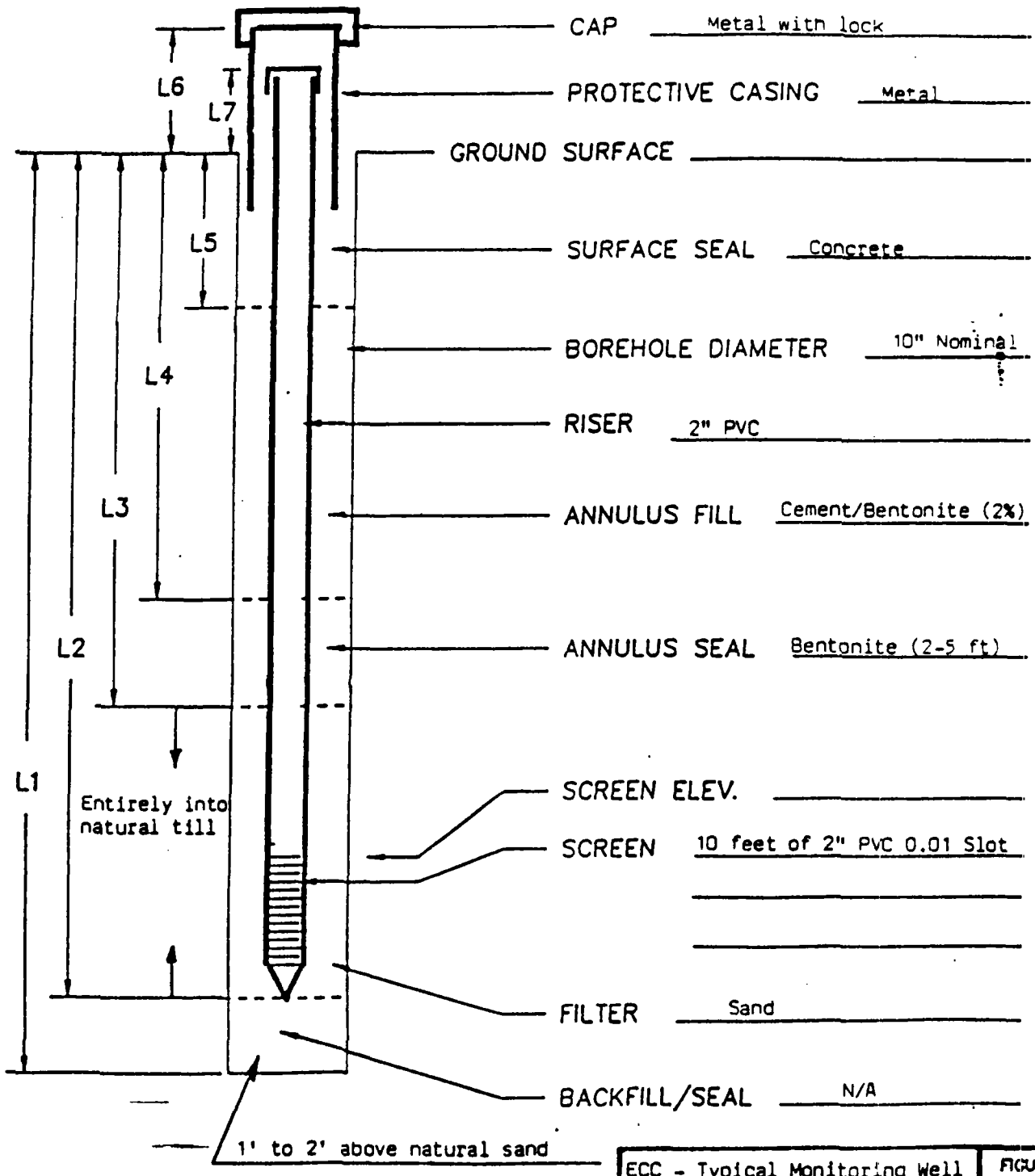
ERM ERM-North Central, Inc.

8/18/89

the sand and gravel. Sampling results from these wells will be used to determine compliance with the Acceptable Stream Concentrations in Table 3-1 or the Applicable Surface Water Background Concentrations of Table 3-1. This second subsurface water monitoring network will consist of ten (10) new wells, which will be located around the periphery of and downgradient from the ECC site, and one existing monitoring well, ECC MW-13 (Figure 2-7). In addition, a piezometer will be installed on the east side of the site, as shown in Figure 2-7, to aid in defining the direction of subsurface water flow in the sand and gravel. Six (6) wells will be installed in the till, completed in the saturated zone, and four (4) wells will be completed in the sand and gravel unit underlying the saturated surface till.

All wells (on-site and off-site) will be constructed of 2-inch PVC pipe. Screen length will vary for each well. Total depth for the wells completed in the till will be 1-2 feet less than total depth to the contact between the till and underlying sand and gravel. Wells completed in the sand and gravel will screen the total thickness of that sand and gravel unit. Screens will have a 0.01 inch opening. Wells will have a sand pack to one foot above the top of screen and a bentonite grout to the ground surface. For the on-site till wells, a sampling port will be fabricated in the HDPE membrane which will prevent infiltration of air via these monitoring wells during operation of the soil vapor extraction system. A detail of this sampling port is shown on Figure 2-5. Figures 2-8 and 2-9 illustrate well construction details for the subsurface water monitoring wells in the till and in the sand and gravel, respectively. Details of the piezometer construction are shown in Figure 2-10. The location of the monitoring wells is based on the subsurface water elevation contours shown in Figure 2-11.

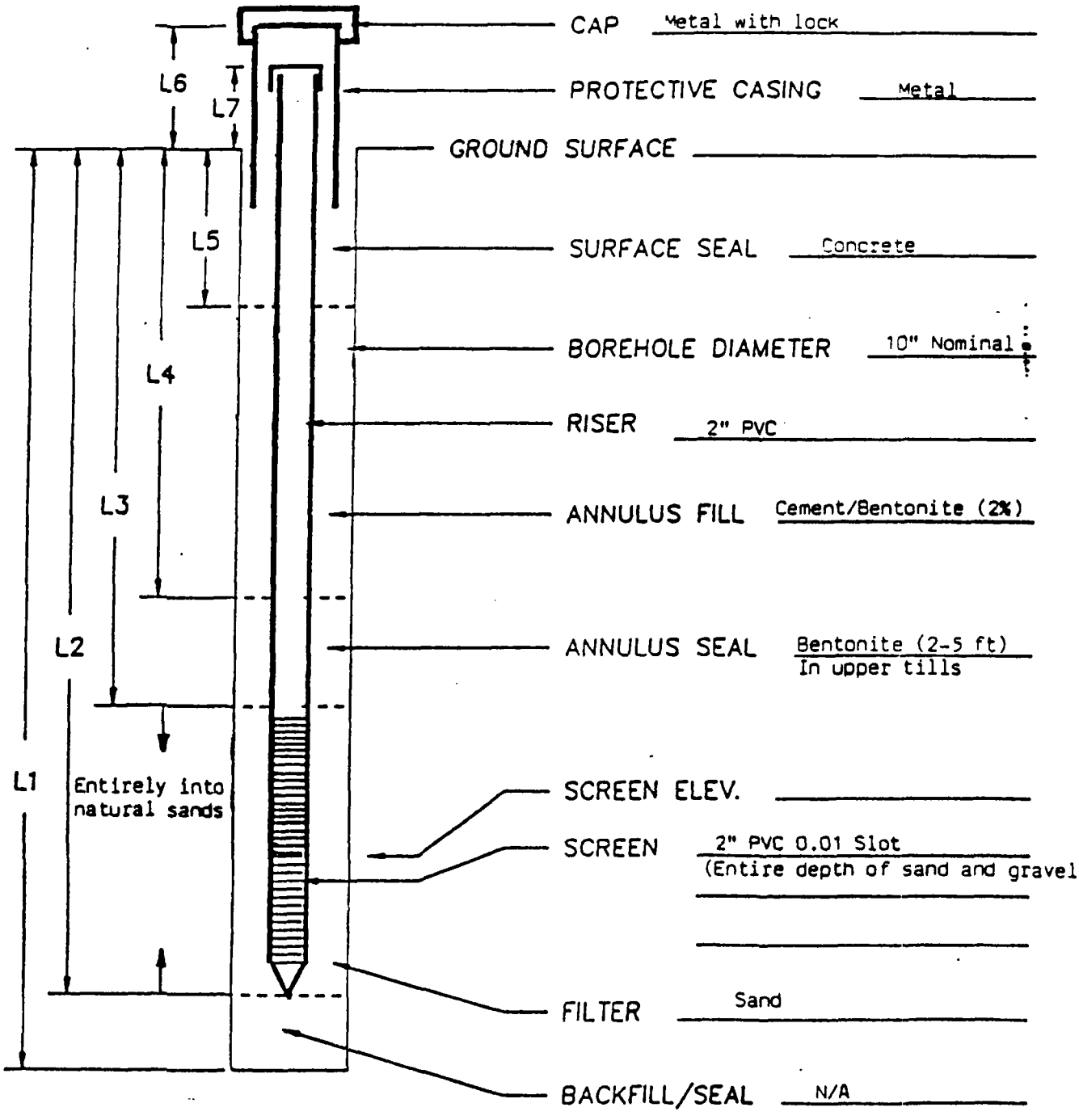
MONITORING WELL CONSTRUCTION



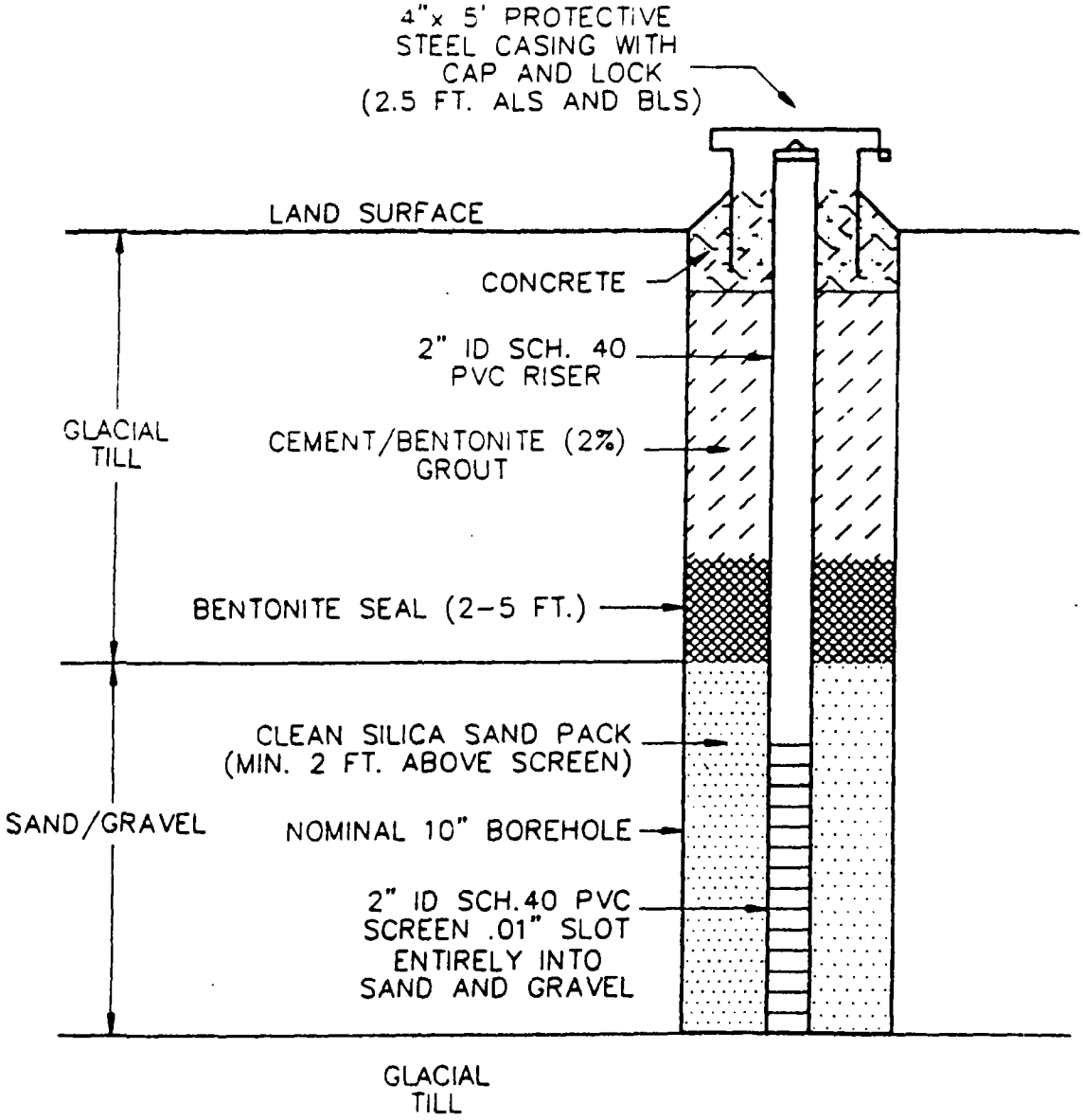
ECC - Typical Monitoring Well Construction Detail Well in Glacial Till

FIGURE 2-8

MONITORING WELL CONSTRUCTION

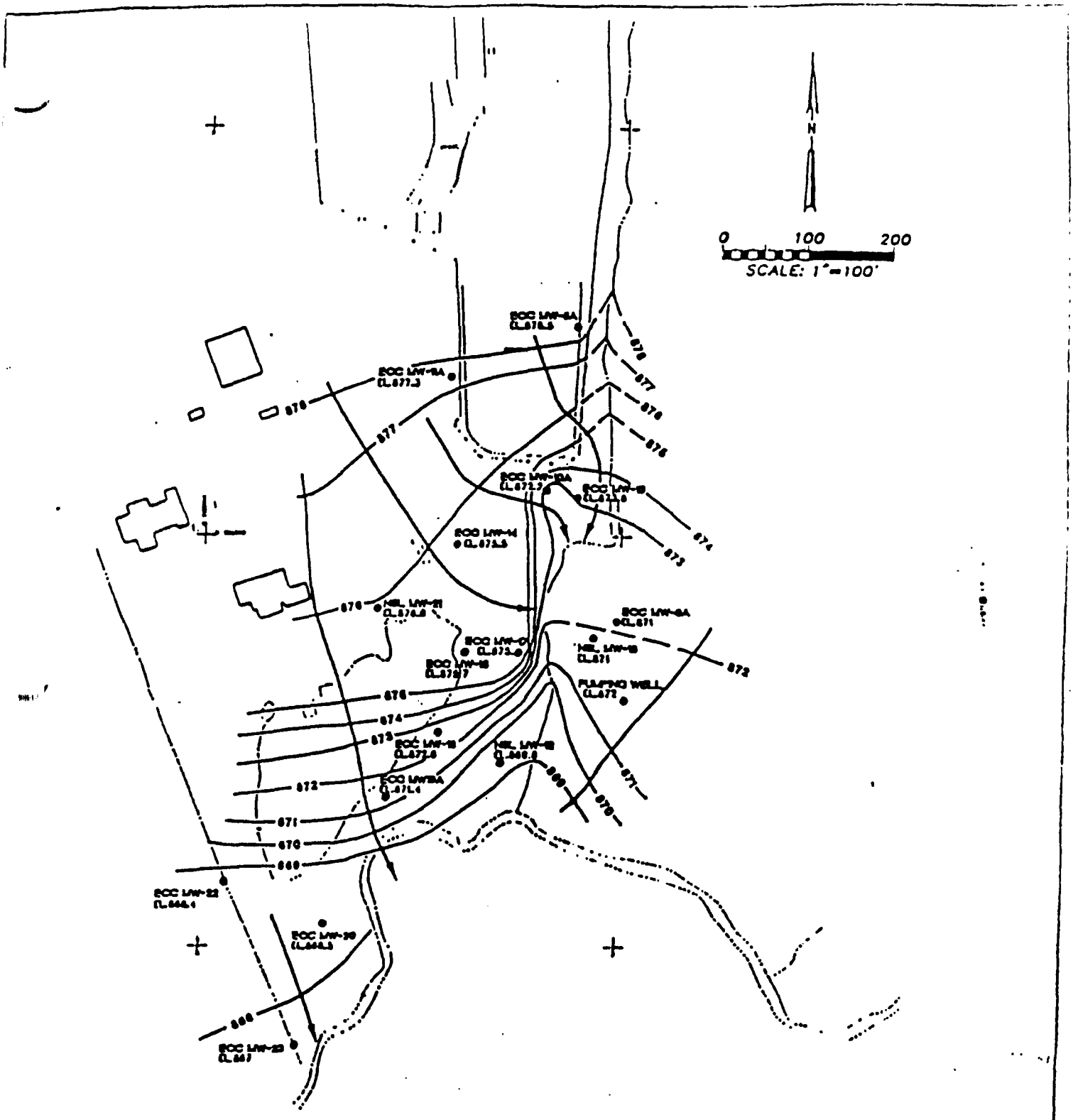


ECC - Typical Monitoring Well Construction Detail Well in Sand & Gravel	FIGURE 2-9



NOT TO SCALE

ECC-TYPICAL PIEZOMETER CONSTRUCTION DETAIL INSTALLED IN SAND AND GRAVEL	FIGURE 2-10
ERM ERM-North Central, Inc.	8/18/89 ms



LEGEND

~~869~~ POTENTIOMETRIC SURFACE CONTOUR FOR SAND AND GRAVEL AQUIFER. CONTOUR INTERVAL 1 FOOT.

--869-- INFERRED POTENTIOMETRIC SURFACE CONTOUR

DIRECTION OF GROUNDWATER MOVEMENT IN SURFICIAL AQUIFER

NOTE: Contours have been drawn to suggest that the pond is not hydraulically connected to the sand and gravel aquifer. This relationship has not been fully established.

From CH2M HILL Technical Memorandum No. 2, dated September 16, 1988.

POTENTIOMETRIC SURFACE MAP OF UPPER SAND AND GRAVEL AQUIFER	FIGURE 2-11
ERM ERM-North Central, Inc.	10/27/88 CS

Samples from the off-site wells will be collected quarterly during operation of the vapor extraction system and analyzed for the parameters with Acceptable Stream Concentrations in Table 3-1. Monitoring will be continued on a semi-annual basis as specified in Section 4.0.

The surface water will be monitored by sampling the Unnamed Ditch just upgradient and just downgradient of the ECC site as depicted in Figure 2-7. Surface water will be sampled at the same frequency as the off-site subsurface water and analyzed for the parameters with Acceptable Stream Concentrations in Table 3-1.

3.0 REMEDIAL ACTION CLEANUP STANDARDS

This section presents site-specific Cleanup Standards to be used at the ECC site as the criteria for determining completion of remedial action. The Cleanup Standards in this section are the basis for establishing the criteria for Soil Cleanup Verification presented in Section 4.2, and the Post-Soil Cleanup Verification Compliance Monitoring in Section 4.3. If Soil Cleanup Verification as defined in Section 4.2 and the subsections thereof is not achieved within 5 years of commencing operation of the soil vapor extraction system, the Additional Work provisions of Section VII of the Consent Decree will apply.

3.1 Cleanup Standards

The following Cleanup Standards will be met for successful completion of the soil vapor extraction program:

- Acceptable Soil Concentrations shown in Table 3-1 will be achieved according to the procedure discussed in Section 4.2.3 of Exhibit A;

- Acceptable Stream Concentrations or Applicable Surface Water Background Concentrations shown in Table 3-1 will be achieved in Unnamed Ditch south of and adjacent to ECC;

- Acceptable Subsurface Water Concentrations or Applicable Subsurface Water Background Concentrations shown in Table 3-1) in the on-site till wells will be achieved; and

- Acceptable Stream Concentrations or Applicable Surface Water Background Concentrations shown in Table 3-1 in the off-site wells will be achieved.

The term "Table 3-1" wherever referred to or used in this Exhibit A and in the Consent Decree includes the Footnotes on pages 2 and 3 of 3 of that table.

3.2 Calculation of Cleanup Standards

Table 3-1 sets forth the ECC site specific Cleanup Standards and

TABLE 3-1 (Page 1 of 2)
SITE-SPECIFIC ACCEPTABLE CONCENTRATIONS
ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION (ECC) SITE

Compounds	Acceptable Subsurface Water Concentration (1,2) (ug/l)		Acceptable Stream Concentration (3,4) (ug/l)	Acceptable Soil Concentration (5,6) (ug/kg)
VOLATILE ORGANICS (VOCs):				
Acetone	3,500	RB		490
Chlorobenzene	60	MCLGP		10,100
Chloroform	100	MCL	15.7	2,300
1,1-Dichloroethane	0.38	RB		5.7
1,1-Dichloroethene	7	MCL	1.85	120
Ethylbenzene	680	MCLGP	3,280	234,000
Methylene Chloride	4.7	RB	15.7	20
Methyl Ethyl Ketone	170	LDWHA		75
Methyl Isobutyl Ketone	1,750	RB		8,900
Tetrachloroethene	0.69	RB	8.85	130
Toluene	2,000	MCLGP	3,400	238,000
1,1,1-Trichloroethane	200	MCL	5,280	7,200
1,1,2-Trichloroethane	0.61	RB	41.8	22
Trichloroethene	5	MCL	80.7	240
Total Xylenes	440	MCLGP		195,000
BASE NEUTRAL/ACID ORGANICS:				
Bis(2-ethylhexyl)phthalate	2.5	RB	50,000	
Di-n-Butyl Phthalate	3,500	RB	154,000	
Diethyl Phthalate	28,000	RB	52,100	
Isophorone	8.5	RB		
Naphthalene	14,000	RB	620	
Phenol	1,400	RB	570	9,800
INORGANICS:				
Antimony	14	RB		
Arsenic	50	MCL	0.0175	
Barium	1,000	MCL		
Beryllium	175	RB		
Cadmium	10	MCL		
Chromium VI	50	MCL	11	
Lead	50	MCL	10	
Manganese	7,000	RB		
Nickel	150	LDWHA	100	
Silver	50	MCL		
Tin	21,000	RB		
Vanadium	245	RB		
Zinc	7,000	RB	47	
Cyanide	154	LDWHA	5.2	
PESTICIDES/PCBs:				
PCBs	0.0045	RB (7)	0.000079 (7,8)	

TABLE 3-1 (Page 2 of 2)
SITE-SPECIFIC ACCEPTABLE CONCENTRATIONS
ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION (ECC SITE)

NOTES:

(1) RB = Risk-based standard. U.S. EPA, Draft RCRA Facility Investigation Guidance, 1987.
MCL = Drinking water Maximum Contaminant Level. 40 CFR 141
MCLGP = Drinking water MCL goal, proposed. U. S. EPA Superfund Public Health Evaluation Manual, update of November 16, 1987.
LDWHA = Lifetime drinking water health advisory. U.S. EPA, Superfund Public Health Evaluation Manual, update of November 16, 1987.

(2) In the event that higher concentrations than those set forth for any parameter in this column are present in the upgradient subsurface water in the till and/or sand and gravel according to the procedure specified below, then those higher upgradient subsurface water concentrations and not the values set forth in this table shall constitute the Acceptable Subsurface Water Concentrations within the meaning of this Exhibit A and the Consent Decree. Those upgradient subsurface water concentrations are referred to in this Exhibit A as "Applicable Subsurface Water Background Concentrations." Twelve subsurface water samples will be taken from existing or new well locations, approved by EPA, over at least a 12 month period in areas upgradient of the site. The exact procedure, location of wells, and schedule for collecting and analyzing the samples will be approved by EPA, after consultation with the State, prior to its implementation. Subsurface samples for inorganics and PCB analysis will be filtered. For each parameter, the analytical results from the 12 samples will be analyzed using standard statistical procedures. The mean and standard deviation will be calculated, and all non-detects will be assigned a value equal to 1/2 the EPA-approved quantification limit. For purposes of this Document, "Applicable Subsurface Water Background Concentrations" is defined as two (2) standard deviations above the calculated mean of these 12 samples.

(3) Stream Criteria, from Table 1 of the Record of Decision for the site, September 25, 1987.

(4) In the event that higher concentrations than those set forth for any parameter in this column are present in the upstream surface water, then those higher upstream concentrations and not the values set forth in this table shall constitute the Acceptable Stream Concentrations within the meaning of this Exhibit A and the Consent Decree. Those higher upstream surface water concentrations are referred to in this Exhibit A as

"Applicable Surface Water Background Concentrations." Twelve surface water samples will be taken from Unnamed Ditch upstream of the site over at least a 12 month period. The exact procedure, location of samples, and schedule for collecting and analyzing the samples will be approved by EPA, after consultation with the State, prior to its implementation. For each parameter, the analytical results from the 12 samples will be analyzed using standard statistical procedures. The mean and standard deviation will be calculated, and all non-detects will be assigned a value equal to 1/2 the EPA-approved quantification limit. For purposes of this Document, "Applicable Surface Water Background Concentrations" is defined as two (2) standard deviations above the calculated mean of these 12 samples.

(5) Acceptable Soil Concentration is based on ingestion of subsurface water at the site boundary, assuming a dilution of leachate to subsurface water of 1:196 (Appendix B).

(6) The Acceptable Soil Concentrations, within the meaning of this Exhibit A and the Consent Decree, will be achieved when the arithmetic average of the 20 soil sample results for each parameter, assigning all non-detect results a value of one-half the detection limit, do not exceed the values set forth in this table by more than 25 percent.

(7) So long as the EPA-approved quantification limit for PCBs in water is above the acceptable subsurface water and stream concentrations for PCBs, compliance with the Acceptable Subsurface and Stream Concentrations for PCBs will be determined as follows: all subsurface and surface water sample results for PCBs must be below the EPA-approved quantification limit for PCBs (at the time compliance is determined).

(8) Modified from Superfund Public Health Evaluation Manual, October, 1986, EPA 4/540/1-86/060, OSWER Directive 9285.4-1.

the procedure for determining Applicable Surface Water and Subsurface Water Background Concentrations. The equations for calculation of the risks, supporting data and complete references are included in Appendix B.

The calculation of risk-based concentrations shown in Table 3-1 follows the procedures presented in the USEPA Draft RCRA Facility Investigation (RFI) Guidance, July, 1987, and in the USEPA Memorandum on Interim Final Guidance for Soil Ingestion Rates, January 27, 1989. In accordance with this latter reference, the soil ingestion rate for risk calculation was either 0.1 grams of soil per day for a 70 kilogram person for 70 years (for compounds with potency factors) or 0.2 grams of soil per day for a 17 kilogram child for 5 years (for compounds with reference doses). In accordance with the RFI Guidance document referenced above, the ingestion rate used for the risk calculation was 2 liters of water per day by a 70 kg person for 70 years.

Three columns of data, corresponding to Acceptable Concentrations for Subsurface Water, Stream and Soil are presented in Table 3-1. Additionally, Applicable Subsurface Water Background Concentrations, and Applicable Surface Water Background Concentrations are defined in Table 3-1. The Acceptable Subsurface Water Concentrations are based on either drinking water standards or criteria (Maximum Contaminant Level [MCL], proposed Maximum Contaminant Level Goal [MCLGP], lifetime drinking water health advisory [LDWHA]) or the appropriate risk-based concentration. These limits assume, as a worst case, that the subsurface water in the till could be utilized as a lifetime source of drinking water. However, the use of the subsurface water in the till as a source of drinking water was rejected as unlikely in the ECC Remedial Investigation (RI), page 6-22. As

a result, the use of drinking water standards and risk-based standards based upon daily, long-term human consumption of the till water for Cleanup Standards under this Remedial Action Plan represents an extremely conservative assumption when the real-life risks, if any, presented by the ECC site are considered.

The Acceptable Stream Concentrations are taken from the Record of Decision (ROD) for the site, dated September 25, 1987.

The Acceptable Soil Concentrations in Table 3-1 are based on the lowest of the risk-based concentrations for soil or subsurface water ingestion, from Tables B5 and B6.

Table 3-2 presents the compounds detected in soils at the site at levels above the Acceptable Soil Concentrations specified in Table 3-1. Table 3-3 shows the vapor pressure and solubility of these compounds.

3.3 Additional Work

If Additional Work is required under Section VII of the Consent Decree, Settling Defendants shall perform the following additional work at the site unless the parties agree otherwise:

- Maintain the RCRA-compliant (Subtitle C) cover and the access restrictions.

- Construct a subsurface water interception trench around the south and east sides of the ECC site as depicted in Figures 3-1 and 3-2.

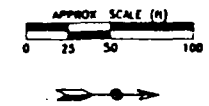
- Collect and transport subsurface water

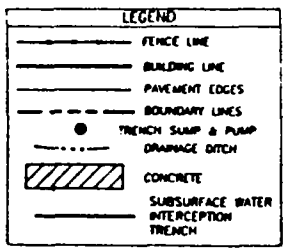
NOTES:

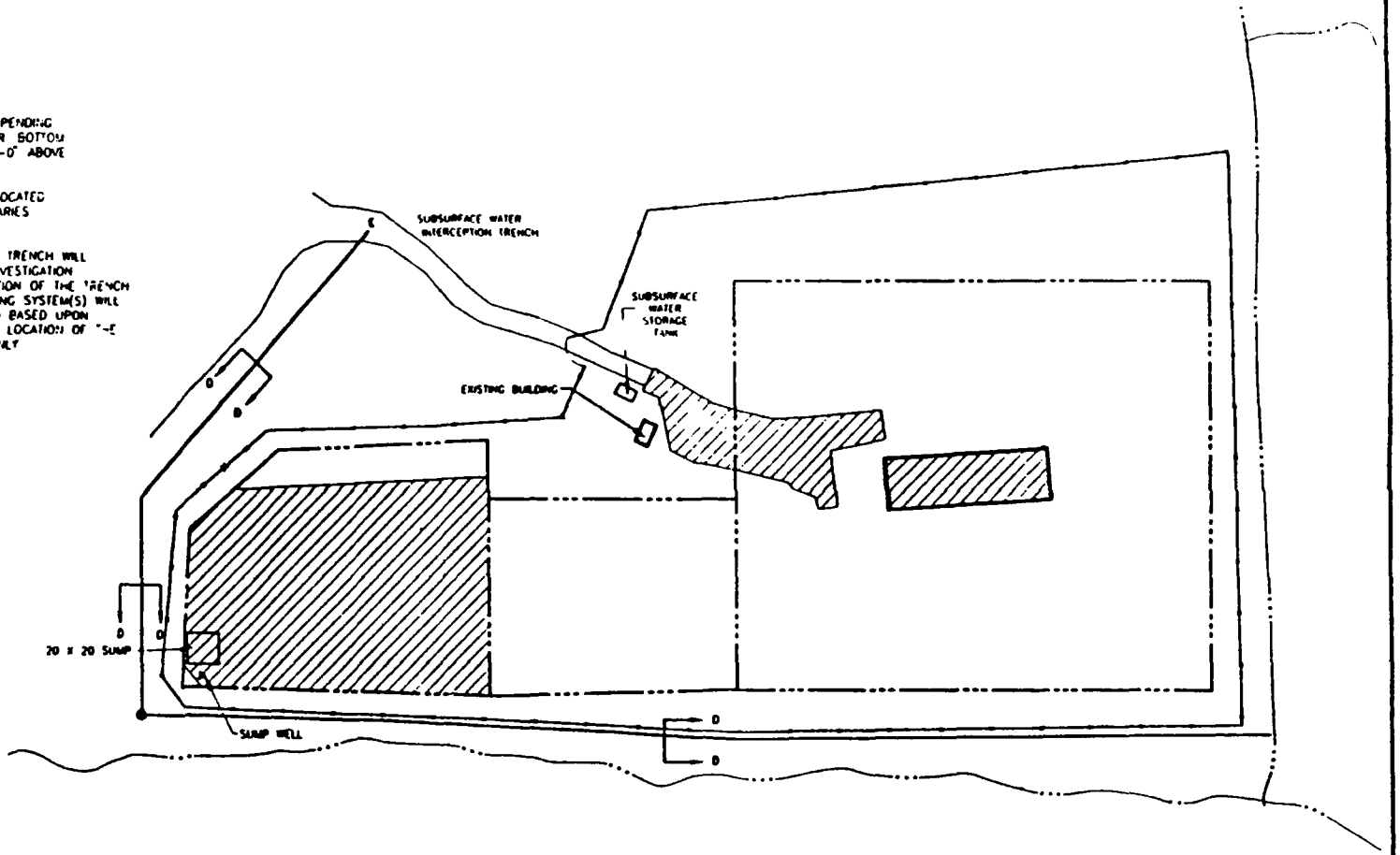
1) DEPTH OF TRENCH WILL VARY DEPENDING ON DEPTH OF GLACIAL TILL LAYER. BOTTOM OF TRENCH TO BE LOCATED ~1'-0" ABOVE UNDERLYING GLACIAL SAND.

2) INTERCEPTION TRENCH WILL BE LOCATED BETWEEN REMEDIAL AREA BOUNDARIES AND UNNAMED DITCH.

3) LOW POINT(S) FOR INTERCEPTION TRENCH WILL BE DETERMINED DURING FIELD INVESTIGATION WORK REQUIRED FOR CONSTRUCTION OF THE TRENCH SUMP(S) AND ASSOCIATED PUMPING SYSTEM(S) WILL BE CONSTRUCTED AND INSTALLED BASED UPON LOCATION OF LOW POINT(S). THE LOCATION OF THE SUMP SHOWN IS ILLUSTRATIVE ONLY.







ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION ZIONSVILLE, INDIANA SUBSURFACE WATER INTERCEPTION TRENCH	FIGURE NO 3-1
ERM ERM-North Central, Inc.	7/19/89 CS

TABLE 3-2
COMPOUNDS DETECTED IN THE SOIL AT CONCENTRATIONS
ABOVE THE ACCEPTABLE SOIL CONCENTRATIONS (1)

Compound	Acceptable Soil Concentration (ug/kg)	Maximum Detected Concentration (ug/kg)
VOLATILE ORGANICS (VOCs):		
Acetone	490	650,000
Chloroform	2,300	2,900
1,1-Dichloroethane	5.7	35,000
1,1-Dichloroethene	120	380
Ethylbenzene	234,000	1,500,000
Methylene Chloride	20	310,000
Methyl Ethyl Ketone	75	2,800,000
Methyl Isobutyl Ketone	8,900	190,000
Tetrachloroethene	130	650,000
Toluene	238,000	2,000,000
1,1,1-Trichloroethane	7,200	1,100,000
1,1,2-Trichloroethane	22	550
Trichloroethene	240	4,800,000
Total Xylenes	195,000	6,800,000
BASE NEUTRAL/ACID ORGANICS:		
Phenol	9,800	570,000

(1) Acceptable Soil Concentrations are determined in accordance with Footnotes 5 and 6 of Table 3-1.

TABLE 3-3
CHEMICAL PROPERTIES OF ORGANIC COMPOUNDS
DETECTED IN THE SOILS AT CONCENTRATIONS
ABOVE THE ACCEPTABLE SOIL CONCENTRATIONS (1)

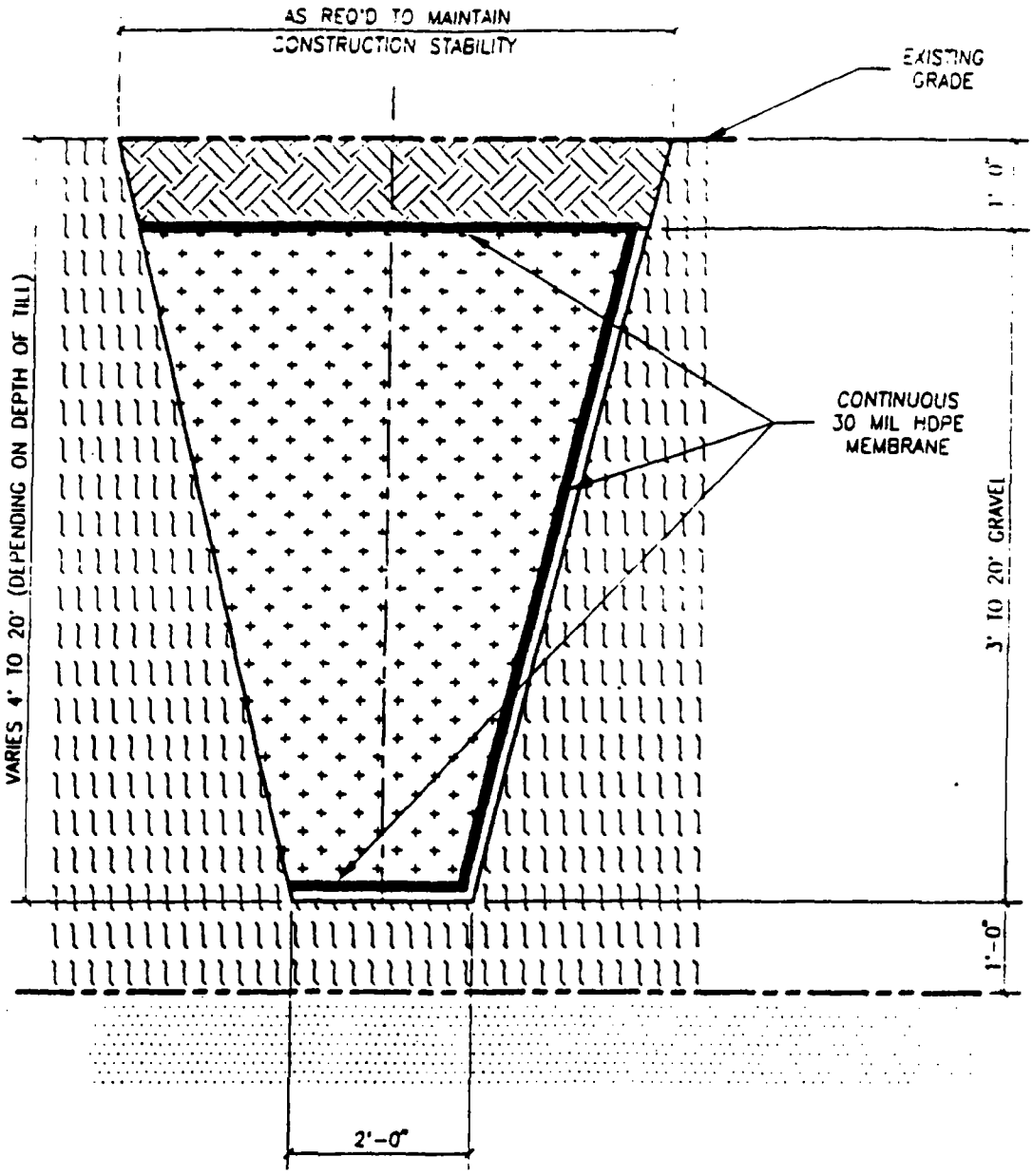
Compound	Solubility (ug/l)	Vapor Pressure (mm Hg)
VOLATILE ORGANICS (VOCs):		
Acetone	1,000,000,000	270
Chloroform	8,200,000	151
1,1-Dichloroethane	5,500,000	182
1,1-Dichloroethene	2,250,000	600
Ethylbenzene	152,000	7
Methylene Chloride	20,000,000	362
Methyl Ethyl Ketone	268,000,000	77.5
Methyl Isobutyl Ketone	17,000,000	6
Tetrachloroethene	200,000	17.8
Toluene	535,000	28.1
1,1,1-Trichloroethane	4,400,000	123
1,1,2-Trichloroethane	4,500,000	30
Trichloroethene	1,100,000	57.9
Total Xylenes	198,000	10
BASE NEUTRAL/ACID ORGANICS:		
Phenol	93,000,000	0.341

(1) Acceptable Soil Concentrations are determined in accordance with Footnotes 5 and 6 of Table 3-1.

REFERENCES:

U.S. EPA, "Superfund Public Health Evaluation Manual," 1986.

U.S. EPA, "Water-Related Environmental Fate of 129 Priority Pollutants," December 1979.



LEGEND:

- COMPACTED NATIVE SOIL
- WASHED FLOAT STONE
- SAND
- GLACIAL TILL
- 30 MIL HDPE COVER

SUBSURFACE WATER INTERCEPTION TRENCH CROSS-SECTION	FIGURE 3-2
ERM ERM-North Central, Inc.	6/23/89

intercepted in this trench to the Indianapolis POTW (via the NSL pipeline or tank truck), or provide other appropriate handling and treatment of such water in accordance with applicable Federal, State and local requirements.

- Subsurface water will continue to be removed and handled in this manner until "confirmed" analytical results from two consecutive, semi-annual subsurface water samples collected from the interception trench show that the Acceptable Stream Concentrations in Table 3-1 or Applicable Surface Water Background Concentrations have been met, unless the Parties to the Decree otherwise agree.

- Semi-annual monitoring of off-site wells and surface water will continue for five years after the Acceptable Stream Concentrations in Table 3-1 or Applicable Surface Water Background Concentrations have been achieved.

- If "confirmed" analytical results from two consecutive semi-annual samples collected during the 5 years of off-site monitoring in either the surface water or the wells indicate that the same parameter exceeds its Acceptable Stream Concentration or Applicable Surface Water Background Concentration at the same monitoring point, then subsurface water collection and treatment will be reinstituted.

As used in this section and in section 4.3 below, the term "confirmed" shall permit the Parties to demonstrate that an analytical result is not accurate as a result of errors in sampling, analysis, or evaluation or that it otherwise mischaracterizes the concentration of a parameter. The procedures used to obtain "confirmed" data shall include reanalysis, resampling and the analysis of only undiluted samples if a concentration is qualified with a "J" (estimated concentration). If after reanalysis and/or resampling using an undiluted sample the concentration of a compound is still qualified with a "J", then the result produced from undiluted samples will be used. "B" qualified samples results will be considered as "confirmed" data only if the concentrations in the sample exceed ten times the maximum amount detected in any blank for the media being analyzed.

4.0 REMEDIAL ACTION VERIFICATION AND COMPLIANCE MONITORING

The soil vapor extraction system described herein is designed to achieve the cleanup standards for VOCs as presented in Table 3-1 and phenol. The time required to accomplish this removal depends on the type of compound and soil, air flow rate and temperature, and on an efficient diffusion of air through the soil pores. The time required for treatment was estimated using a vapor extraction model, as described below and in Appendix C. Monitoring of vapor from the combined vapor stream and from individual trenches, as described below, will also be used to estimate completion of the soil vapor extraction system operation. Afterwards, verification of soil cleanup will be accomplished by: (1) soil vapor monitoring of restart spikes;

(2) on-site subsurface till water monitoring; and (3) soil sampling ("Soil Cleanup Verification").

Compliance monitoring will consist of sampling of surface water in Unnamed Ditch, and sampling of subsurface water in off-site till and sand and gravel monitoring wells and on-site till monitoring wells ("Compliance Monitoring").

4.1 Estimation of Completion of Vapor Extraction System Operation

A computer model which simulates the vapor extraction system was used to estimate the time required for removal of the maximum detected soil concentrations to the Acceptable Soil Concentrations specified in Table 3-1. Appendix C summarizes the characteristics of the model and the data used. Based on the model results, the Settling Defendants expect that after one year of operation, all the VOCs and phenol will be below the Acceptable Soil Concentrations in Table 3-1 in a "worst case" soil element which contains all the compounds at their maximum detected concentrations.

The vapor extraction system is designed to permit vapor samples to be obtained from each individual extraction trench and from the combined vapor stream from all operating extraction trenches.

The combined vapor flow will be sampled daily during the first week of operation, weekly for the following 4 weeks, and monthly thereafter. Samples will be analyzed for VOCs listed in Table 3-1 and phenol. Also, the vapor flow rate will be monitored and recorded to provide sufficient data to calculate the mass of

organics removed from the soils and the effectiveness of the system. These data will also aid in estimating the treatment time remaining, based on the calculated mass extraction rate (lbs/day) of the VOCs listed in Table 3-1 and phenol.

Vapor samples from individual extraction trenches will be collected at the beginning of the vapor extraction system operation to establish a baseline of organics removal per trench. These samples will be analyzed for the VOCs listed in Table 3-1 and phenol. Once the mass rate extracted per day is reduced to 5 percent of the initial week's rate, additional vapor samples of individual trenches will be collected at least every two months, to determine when individual extraction trenches can be shut down. The criterion for shutting down individual trenches will be that two consecutive air samples from an individual trench show vapor concentrations to be in equilibrium with the Acceptable Soil Concentrations in Table 3-1. Table 4-1 shows the soil vapor concentrations in equilibrium with the Acceptable Soil Concentrations for the VOCs listed in Table 3-1 and phenol. Appendix D presents the methodology used to arrive at these equilibrium vapor concentrations.

4.2 Soil Cleanup Verification

Verification of soil cleanup will be established when each of the following is met: (1) the soil vapor from the restart spike tests shows compliance with the calculated soil vapor concentrations in equilibrium with Acceptable Soil Concentrations for the VOCs listed in Table 3-1 and phenol ("Soil Vapor Criterion"); (2) on-site till wells show compliance with the Acceptable Subsurface Water Concentrations specified in Table 3-1 or Applicable Subsurface Water Background Concentrations ("Onsite Till Water

TABLE 4-1
SOIL VAPOR CONCENTRATIONS IN EQUILIBRIUM
WITH ACCEPTABLE SOIL CONCENTRATIONS (1)

Compound (2)	Soil Vapor Concentration (3) (mg/l)	ppmv
VOLATILE ORGANICS (VOCs):		
Acetone	0.613	254
Chloroform	2.46	496
1,1-Dichloroethane	0.014	3.4
1,1-Dichloroethene	2.045	515
Ethylbenzene	37	9,316
Methylene Chloride	0.079	22.4
Methyl Ethyl Ketone	0.039	13
Methyl Isobutyl Ketone	0.685	233
Tetrachloroethene	0.116	16.8
Toluene	107	36,556
1,1,1-Trichloroethane	8.29	2,819
1,1,2-Trichloroethane	0.0060	1.1
Trichloroethene	0.39	71.5
Total Xylenes	26.2	4,794
BASE NEUTRAL/ACID ORGANICS:		
Phenol	0.0053	1.4

(1) Acceptable Soil Concentrations are determined in accordance with Footnotes 5 and 6 of Table 3-1.
(2) Compounds above acceptable soil concentrations in Table 3-1 to be removed by vapor extraction.
(3) From Appendix D.

Criterion"); and (3) soil samples show compliance with the Acceptable Soil Concentrations as specified in Table 3-1 ("Soil Sample Criterion"). If Soil Cleanup Verification is not established, vapor extraction will be restarted. If after five years from the initial commencement of soil vapor extraction (or sooner as permitted in the Decree), Soil Cleanup Verification has not been established, then the Additional Work provisions of Section VII of the Consent Decree will apply.

4.2.1 Soil Vapor Criterion

Once the combined vapor flow and individual trench vapor samples show concentrations of Table 3-1 VOCs and phenol at or below their respective equilibrium soil vapor concentrations shown in Table 4-1, the "restart spike" method on the combined vapor flow will be used to demonstrate that the Soil Vapor Criterion for Soil Cleanup Verification has been achieved.

The "restart spike" method consists of periodically shutting down and restarting the vapor extraction system. By shutting down the system, equilibrium conditions between the vapor space within the soil and any remaining organics amenable to vapor extraction within the soil matrix are re-established. Therefore, when the vapor extraction system is restarted, the initial organics concentration in the extracted gas will be higher than under normal operation.

The restart spike procedure will include shutting down the vapor extraction system for a period of three days. Upon restarting the vapor extraction system, all extraction and injection trenches will be operated as during normal operation. A sample of the combined soil vapor will be collected over a five-hour

period starting 30 minutes after restarting the vapor extraction system. This sample will be representative of the soil vapor concentrations in equilibrium with the soil concentrations, because at 500 SCFM, the vapor extraction system will exchange one pore volume of soil every five hours.

The Soil Vapor Criterion will be met when analyses of soil vapor samples collected from four consecutive restart spikes conducted once every two weeks show that concentrations of VOCs and phenol in Table 3-1 are at or below equilibrium soil vapor concentrations shown in Table 4-1 and therefore by calculation can be shown to be at or below the Acceptable Soil Concentrations in Table 3-1.

4.2.2 On-site Till Water Criterion

Samples of the subsurface water from the on-site till monitoring wells will be collected quarterly during operating of the soil vapor extraction system. The most recent quarterly sampling results from the four on-site till water monitoring wells following demonstration that the Soil Vapor Criterion has been achieved (Section 4.2.1) will be used to demonstrate that the On-site Till Water Criterion for Soil Cleanup Verification has been achieved.

This criterion will be met when analyses of the water samples collected from each of the four on-site till wells show that the concentrations for parameters with Acceptable Subsurface Water Concentrations in Table 3-1 are at or below the Acceptable Subsurface Water Concentrations in Table 3-1 or Applicable Subsurface Water Background Concentrations.

4.2.3 Soil Sample Criterion

Once the Soil Vapor Criterion and Onsite Till Water Criterion for Soil Cleanup Verification have been demonstrated as defined above, a total of twenty (20) soil samples from areas selected by EPA and the State will be collected. These twenty (20) will be selected as follows: sixteen soil samples will be from "hot" spot areas and four non-background samples will be from randomly selected points elsewhere onsite. The total number of soil samples used to demonstrate that the Soil Sample Criterion for Soil Cleanup Verification will not exceed 20. Each soil sample will be analyzed for the VOCs in Table 3-1 and phenol. Verification of this criterion for all VOCs in Table 3-1 and phenol relative to the Acceptable Soil Concentration in Table 3-1. If the results from this initial round of soil samples verify that the Acceptable Soil Concentrations in Table 3-1 have been met, then the Soil Sample Criterion for Soil Cleanup Verification will have been achieved.

In the event that the soil sampling results do not verify that the Acceptable Soil Concentrations as defined in Table 3-1 have been met, and the soil vapor extraction system is operated for an additional period of time, an additional 20 soil samples must be taken in the same approximate locations (i.e., within a 3-foot radius) as the initial sample locations. Results from this second sampling will be analyzed using the identical procedure outlined above to verify that the Acceptable Soil Concentrations in Table 3-1 as described in Footnote 6 of Table 3-1 have been met. If the results from any subsequent round of soil samples demonstrate that the Acceptable Soil Concentrations in Table 3-1 have been met, then the Soil Sample Criterion for Soil Cleanup Verification will have been achieved.

4.3 Post Soil Cleanup Compliance Monitoring

Once Soil Cleanup Verification has been achieved as prescribed in Section 4.2, sampling of off-site till wells, on-site till wells, off-site sand and gravel wells and surface water will be conducted for seven years on a semi-annual basis.

Off-site wells and surface water will be analyzed for the parameters with Acceptable Stream Concentrations in Table 3-1. Onsite wells will be analyzed for parameters with Acceptable Subsurface Water Concentrations in Table 3-1.

If "confirmed" analytical results from two consecutive semi-annual samples collected during the Compliance Monitoring period indicate that the same parameter exceeds its Cleanup Standard (or the Applicable Surface Water or Subsurface Water Background Concentration) at the same monitoring point, then the Additional Work provisions of Section VII of the Decree will apply. If the conditions set forth in the preceding sentence do not occur, monitoring will be discontinued at the end of the Compliance Monitoring period and the provisions of Section XXVI of the Decree will apply.

5.0 MISCELLANEOUS PROVISIONS AND SCHEDULING

The following documents have been submitted to EPA and the State for review and approval by EPA: (1) Health and Safety Plan, (2) Field Sampling Plan, and (3) Quality Assurance Project Plan. Construction drawings and contract specifications will be submitted to EPA and the State within three months from the entry of the Consent Decree. Comments provided by EPA and the State

will be addressed by the Settling Defendants.

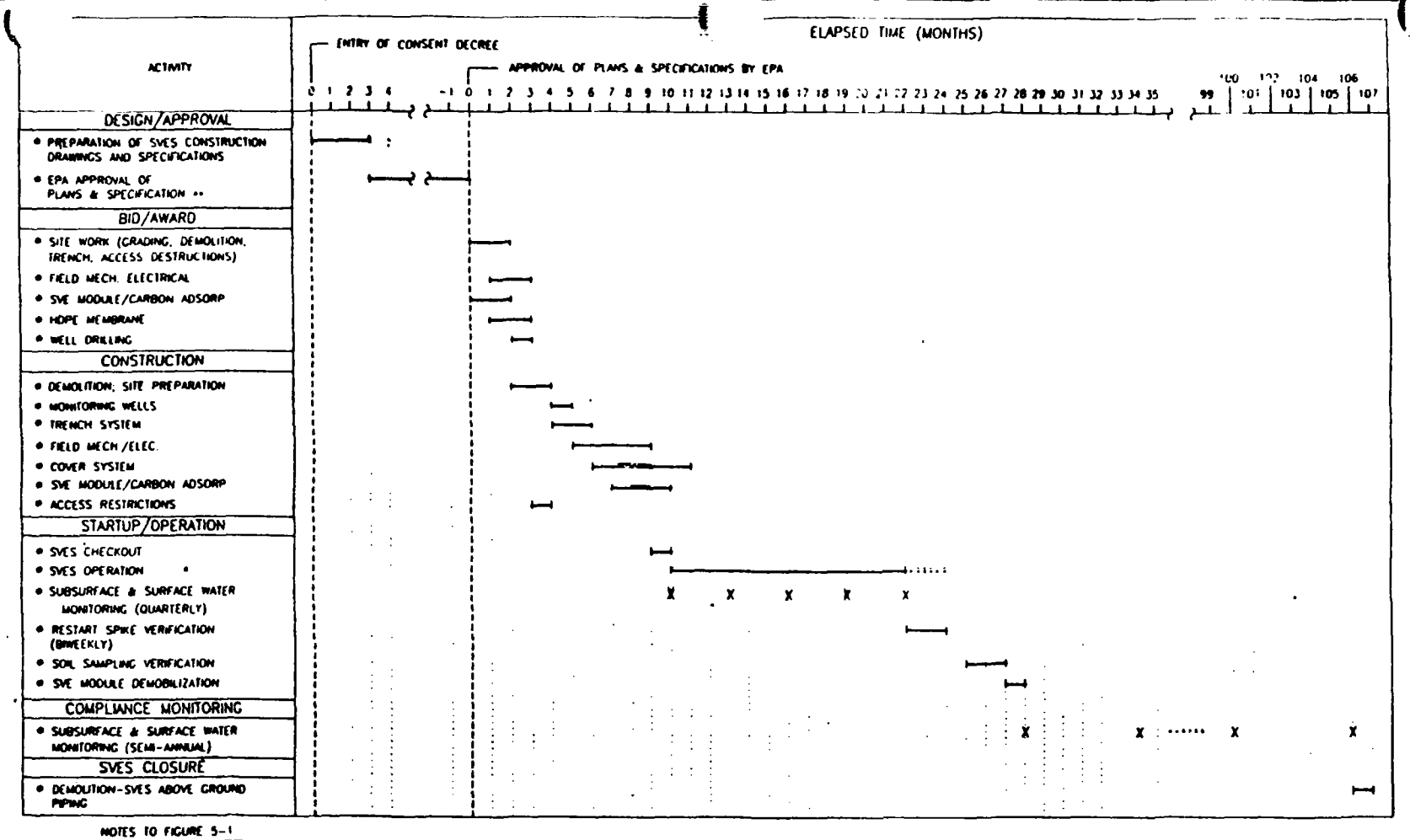
Figure 5-1 sets forth the Remedial Action Implementation Schedule for implementing the remedy required under the Consent Decree. The following milestones have been established in Section XVII (Stipulated Penalties) of the Consent Decree:

- Submission of the project plans, construction contract specifications and revised drawings necessary to solicit competitive bidding within 3 months from the entry of the Decree.

- Completion of site preparation, including grading, removal of the tanks and buildings, repair or moving of the fence, 4 months after approval by EPA all of the above referenced documents. Completion of the site preparation shall mean that all hindrances, obstructions or obstacles to construction and security of the soil vapor extraction trenches, monitoring wells or cap have been removed.

- Completion of installation of the on-site and off-site monitoring wells 5 months after approval by EPA of all of the above referenced documents.

- Startup of the soil vapor extraction system 10 months after approval by EPA of all of the above referenced documents.



NOTES TO FIGURE 5-1

- SVES ≙ SOIL VAPOR EXTRACTION SYSTEM
- * SCHEDULE ASSUMES 12 MONTH OPERATION OF SVES. ACTUAL PERIOD OF OPERATION COULD BE SHORTER OR LONGER DEPENDING ON PERFORMANCE OF SVES. THE SCHEDULE FOR EACH ACTIVITY LISTED BELOW "SVES OPERATION" WILL BE ADJUSTED ACCORDINGLY AS DESCRIBED IN SECTION 4.0 OF EXHIBIT A

** "PLANS AND SPECIFICATIONS" MEANS "PROJECT PLANS, CONSTRUCTION CONTRACT SPECIFICATIONS, AND REVISED DRAWINGS NECESSARY TO SOLICIT COMPETITIVE BIDDING"

REMEDIAL ACTION IMPLEMENTATION SCHEDULE	FIGURE NO. 5--1
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- Completion of the installation of all components of the RCRA-compliant (Subtitle C) cover 11 months after approval by EPA of all of the above referenced documents.

- Submission of all documents necessary to perform Additional Work that may be required under Section VII of the Consent Decree 6 months after written notice has been provided by EPA or Settling Defendants that Additional Work needs to be implemented.

- Completion of installation of the subsurface water interception trench on a schedule to be determined by EPA after consultation with the State.

APPENDICES

APPENDIX A

ESTIMATE OF MASS OF ORGANICS IN THE SOILS TO BE REMOVED BY VAPOR EXTRACTION

APPENDIX A
ESTIMATE OF MASS OF ORGANICS IN THE SOILS
TO BE REMOVED BY VAPOR EXTRACTION

Location	Sampling depth (ft)	Assumed contamination depth (ft)	Total concentration (ug/kg)	Mass (lb)
TP-1	1 - 1.5	2	1,972	0.271
TP-2	1 - 1.5	2	28	0.004
TP-3	1 - 1.5	2	108,800	14.978
TP-4	1 - 2	2.5	99,730	17.162
TP-4	2.5 - 3.5	4	4,416	1.216
TP-5	1 - 2	2	24,287	3.343
TP-5	2 - 3	1.5	291	0.030
TP-6	1 - 2	2	12,468,000	1,716.410
TP-6	2 - 3	1.5	22,690	2.343
TP-6	4 - 5	1.5	2,416	0.249
TP-7	1 - 2.5	2.5	267,000	45.946
TP-7	2.5 - 4	2	280,090	38.559
TP-8	1 - 2.5	2.5	3,687	0.634
TP-8	2.5 - 4	2	433,600	59.692
TP-9	1 - 3	3	14,604,000	3,015.694
TP-9	3 - 5	2.5	130	0.022
TP-10	1 - 3	3	958	0.198
TP-10	3 - 5	2.5	432	0.074
TP-11	1 - 3	3	130	0.027
TP-11	3 - 5	2.5	67	0.012
TP-12	1 - 3	3	35,030	7.234
TP-12	3 - 5	2.5	3,609	0.621
SB-01	2.5 - 4	3	3,303	0.682
SB-02	2.5 - 4	3	12,900	2.664
SB-03	2.5 - 4	3	70,070	14.469
SB-04	2 - 3.5	2.5	175	0.030
SB-06	2 - 3.5	2.5	222,010	38.204
SB-08	2.5 - 4	3	3,012	0.622
SB-09	2.5 - 4	3	61,490	12.698
SB-01	5.5 - 7	2	27	0.004
SB-02	5.5 - 7	2	34	0.005
SB-04	5 - 6.5	2	51	0.007
SB-08	7 - 8.5	2	188	0.026
SB-09	5.7 - 7	2	8,069	1.111
TOTAL ORGANICS TO BE REMOVED BY VAPOR EXTRACTION, lb				4,995

* The area contaminated is assumed to be a 25'x25' square around each sampling location. TP = test pit; SB = soil boring. Soil concentrations from ECC RI, Section 4.

APPENDIX B

CALCULATION OF RISK-BASED CLEANUP STANDARDS

APPENDIX B

CALCULATION OF RISK-BASED CLEANUP STANDARDS

The equations used to calculate risk-based concentrations are shown in Table B1. The ingestion rates and acceptable risks are listed in Table B2. The potency factors and references doses for compounds without any regulatory or background level are from a memorandum from the USEPA Toxics Integration Branch, OERR, Washington, D.C., dated December 19, 1988, with the Corrections to the July, 1988 Update of the Characterization Tables in the Superfund Public Health Evaluation Manual.

Table B3 presents the calculation of risk-based acceptable subsurface water concentrations in the till for compounds without a regulatory limit (drinking water Maximum Contaminant Level, Maximum Contaminant Level Goal or lifetime health advisory or a stream criterion as listed in Table 1 of the Record of Decision for the site). Table B4 shows that the resulting concentrations of inorganic compounds at Unnamed Ditch should be below the Stream Criteria presented in Table 1 of the Record of Decision (ROD) for the site, dated September 25, 1987. The dilution obtained from discharge of the subsurface water in the till to Unnamed Ditch is 1:1800, as presented in Appendix C of the ECC Remedial Investigation. Note that most of the calculated concentrations in the ditch are below detection limits.

Tables B5 and B6 list the acceptable risk-based soil concentrations, based on soil and subsurface water ingestion, respectively. The calculation of acceptable soil concentrations based on subsurface water ingestion follows the procedures presented in Appendix C of the ECC RI. Only those organic compounds without regulatory limit (USEPA, Polychlorinated

TABLE B1
EQUATIONS USED TO CALCULATE RISK-BASED CONCENTRATIONS *

SOIL (concentrations in ug/kg):

$$\frac{\text{Risk} * \text{Body Weight (kg)} * 1000\ (\text{ug/mg}) * 1000\ (\text{g/kg})}{\text{Ingestion rate (g/d)} * \text{Potency Factor (mg/kg/d)-1}}$$

or

$$\frac{\text{Risk} * \text{Body Weight (kg)} * \text{Reference Dose (mg/kg/d)} * 1000\ (\text{ug/mg}) * 1000\ (\text{g/kg})}{\text{Ingestion rate (g/d)}}$$

SUBSURFACE WATER (concentrations in ug/l):

$$\frac{\text{Risk} * \text{Body Weight (kg)} * 1000\ (\text{ug/mg})}{\text{Ingestion rate (l/d)} * \text{Potency Factor (mg/kg/d)-1}}$$

or

$$\frac{\text{Risk} * \text{Body Weight (kg)} * \text{Reference Dose (mg/kg/d)} * 1000\ (\text{ug/mg})}{\text{Ingestion rate (l/d)}}$$

TABLE B2
INGESTION RATES AND ACCEPTABLE RISKS

INGESTION RATES * :

SOILS:

0.1 grams per day by a 70-kilogram person for 70 years

or

0.2 grams per day by a 17-kilogram child for 5 years

SUBSURFACE WATER:

2 liters of water per day by a 70-kilogram person for 70 years

ACCEPTABLE RISKS:

COMPOUNDS WITH POTENCY FACTORS:

10^{-6}

COMPOUNDS WITH REFERENCE DOSES:

1

* From U.S. EPA, RCRA Facility Investigation Guidance, 1987, and U.S. EPA, Office of Solid Waste and Emergency Response, Memorandum on Interim Final Guidance for Soil Ingestion Rates, January 27, 1989.

TABLE B3
ECC - ACCEPTABLE HEALTH-BASED SUBSURFACE WATER CONCENTRATIONS

Compound (1)	Potency Factor (2) (mg/kg/d)-1	Reference Dose (2) (mg/kg/d)	Acceptable Health-Based Subsurface Water Concentration (3) (ug/l)
VOLATILE ORGANICS (VOCs):			
Acetone		0.1	3,500
1,1-Dichloroethane	0.091		0.38
Methylene Chloride	0.0075		4.7
Methyl Isobutyl Ketone		0.05	1,750
Tetrachloroethene	0.051		0.69
1,1,2-Trichloroethane	0.057		0.61
BASE NEUTRAL/ACID ORGANICS:			
Bis(2-ethylhexyl)phthalate	0.014		2.5
Di-n-Butyl Phthalate		0.1	3,500
Diethyl Phthalate		0.8	28,000
Isophorone	0.0041		8.5
Naphthalene		0.4	14,000
Phenol		0.04	1,400
PESTICIDES/PCBs:			
Aroclor-1232	7.7		0.0045
Aroclor-1260	7.7		0.0045
INORGANICS:			
Antimony		0.0004	14
Beryllium		0.005	175
Manganese		0.2	7,000
Tin		0.6	21,000
Vanadium		0.007	245
Zinc		0.2	7,000

(1) Only compounds without a regulatory limit (drinking water Maximum Contaminant Level [40 CFR 141], Maximum Contaminant Level Goal or lifetime health advisory) are shown.

(2) From USEPA Toxics Integration Branch, OERR, Washington, D.C. December 1988 correction to the July 1988 Update of the Risk Characterization Tables in the Superfund Public Health Evaluation Manual.

(3) Acceptable subsurface water concentrations calculated using an ingestion rate of 2 liters per day by a 70 kg adult for 70 years. Acceptable risk = 1E-06 for compounds with potency factor and 1 for compounds with reference dose.

TABLE B4
COMPARISON OF ACCEPTABLE STREAM CONCENTRATIONS
WITH STREAM CONCENTRATIONS BASED ON NATURAL
DISCHARGE OF SUBSURFACE WATER FROM THE TILL

Compounds (1)	Acceptable Stream Concentration (1) (ug/l)	Concentratic Unnamed Ditc to Discharge c Water at Accep Concentration (ug/l)
VOLATILE ORGANICS (VOCs):		
Chloroform	15.7	0.056
1,1-Dichloroethene	1.85	0.0039
Ethylbenzene	3,280	1.9
Methylene Chloride	15.7	0.0026
Tetrachloroethene	8.85	0.00038
Toluene	3,400	5.8
1,1,1-Trichloroethane	5,280	0.11
1,1,2-Trichloroethane	41.8	0.00034
Trichloroethene	80.7	0.0028
BASE NEUTRAL/ACID ORGANICS:		
Bis(2-ethylhexyl)phthalate	50,000	0.0014
Di-n-Butyl Phthalate	154,000	1.9
Diethyl Phthalate	52,100	15.6
Naphthalene	620	7.8
Phenol	570	0.78
INORGANICS:		
Arsenic	0.0175	0.028
Chromium	11	0.028
Lead	10	0.028
Nickel	100	0.39
Zinc	47	3.9
Cyanide	5.2	0.39

(1) From Table 1 of the Record of Decision (ROD) for the site, September 25, 1987. Only those compounds detected in ECC soil samples that are listed in this table are shown.
(2) Assuming a dilution of 1:1800 for natural discharge of till water at acceptable concentrations into Unnamed Ditch (from EC Remedial Investigation, Appendix C).

TABLE B5
ECC - ACCEPTABLE SOIL CONCENTRATIONS BASED ON SOIL INGESTION

Compounds (1)	Potency Factor (2) (mg/kg/d)-1	Reference Dose (2) (mg/kg/d)	Acceptable Soil Concentrations Based on Soil Ingestion (3) (ug/kg)	Range of Acceptable Soil Concentrations Based on Soil Ingestion (4) (ug/kg)
VOLATILE ORGANICS (VOCs):				
Acetone		0.1	8,500,000	8,500,000
Chlorobenzene		0.03	2,550,000	2,550,000
Chloroform	0.0061		114,754	11,475-11,475,400
1,1-Dichloroethane	0.091		7,692	769-769,200
1,1-Dichloroethene	0.6		1,167	116.7-116,700
Ethylbenzene		0.1	8,500,000	8,500,000
Methylene Chloride	0.0075		93,333	9,333-9,333,300
Methyl Ethyl Ketone		0.05	4,250,000	4,250,000
Methyl Isobutyl Ketone		0.05	4,250,000	4,250,000
Tetrachloroethene	0.051		13,725	1,373-1,372,500
Toluene		0.3	25,500,000	25,500,000
1,1,1-Trichloroethane		0.09	7,650,000	7,650,000
1,1,2-Trichloroethane	0.057		12,281	1,228-1,228,100
Trichloroethene	0.011		63,636	6,364-6,363,600
Total Xylenes		2	170,000,000	170,000,000
BASE NEUTRAL/ACID ORGANICS:				
Bis(2-ethylhexyl)phthalate	0.014		50,000	5,000-5,000,000
Di-n-Butyl Phthalate		0.1	8,500,000	8,500,000
Diethyl Phthalate		0.8	68,000,000	68,000,000
Isophorone	0.0041		170,732	17,073-17,073,200
Naphthalene		0.4	34,000,000	34,000,000
Phenol		0.04	3,400,000	3,400,000

NOTES:

(1) Only organic compounds without a regulatory limit in soils (USEPA, "Polychlorinated Biphenyls Spill Cleanup Policy Rule," 40 CFR Part 761) are shown.

(2) From USEPA Toxics Integration Branch, OERR, Washington, D.C. December 19, 1988, "Corrections to the July 1988 Update of the Characterization Tables in the Superfund Public Health Evaluation Manual."

(3) Intake for compounds with potency factor: 0.1 g of soil/d by 70 kg resident adults. Intake for compounds with reference dose: 0.2 g of soil/d by 17 kg resident children. Acceptable risks: 1E-06 for compounds with potency factor; 1 for compounds with reference dose.

(4) Range shown is for risks of 10-4 to 10-7 for compounds with potency factor. The value shown for compounds without potency factor is for a risk of 1.

TABLE B6 (Page 1 of 2)

ECC - ACCEPTABLE SOIL CONCENTRATIONS BASED ON THEORETICAL SUBSURFACE WATER INGESTION AT THE SITE (10-6 RISK)

Compound (1)	Solubility (2) (ug/l)	Log Kow (2)	Kd (3)	Acceptable Subsurface Water Concentration (4) (ug/l)		Acceptable Leachate Concentration (5) (ug/l)	Acceptable Soil Concentration Based on Water Ingestion (6) (ug/kg)
VOLATILE ORGANICS (VOCs):							
Acetone	1,000,000,000	-0.24	0.00071	3,500	RB	686,275	490
Chlorobenzene	466,000	2.84	0.858	60	MCLGP	11,765	10,093
Chloroform	8,200,000	1.97	0.116	100	MCL	19,608	2,269
1,1-Dichloroethane	5,500,000	1.79	0.076	0.38	RB	74.5	5.7
1,1-Dichloroethene	2,250,000	1.84	0.086	7	MCL	1,373	118
Ethylbenzene	152,000	3.15	1.75	680	MCLGP	133,333	233,540
Methylene Chloride	20,000,000	1.25	0.022	4.7	RB	922	20.3
Methyl Ethyl Ketone	268,000,000	0.26	0.00226	170	LOWHA	33,333	75
Methyl Isobutyl Ketone	17,000,000		0.02604	1,750	RB	343,137	8,935
Tetrachloroethene	200,000	2.88	0.941	0.69	RB	135	127
Toluene	535,000	2.69	0.607	2,000	MCLGP	392,157	238,167
1,1,1-Trichloroethane	4,400,000	2.17	0.183	200	MCL	39,216	7,193
1,1,2-Trichloroethane	4,500,000	2.17	0.183	0.61	RB	120	21.9
Trichloroethene	1,100,000	2.29	0.242	5	MCL	980	237
Total Xylenes	198,000	3.26	2.26	440	MCLGP	86,275	194,672
BASE NEUTRAL/ACID ORGANICS:							
Bis(2-ethylhexyl)phthalate	1,300	8.7	621472	2.5	RB	490	304,643,220
Di-n-Butyl Phthalate	13,000	5.2	197	3,500	RB	686,275	134,871,303
Diethyl Phthalate	4,320,000	3.22	2.06	28,000	RB	5,490,196	11,298,207
Isophorone	12,000		0.031	8.5	RB	1,667	51.7
Naphthalene	30,000	3.01	1.269	14,000	RB	2,745,098	3,483,209
Phenol	93,000,000	1.46	0.036	1,400	RB	274,510	9,817

TABLE B6 (Page 2 of 2)

ECC - ACCEPTABLE SOIL CONCENTRATIONS BASED ON THEORETICAL SUBSURFACE WATER INGESTION AT THE SITE (10-6 RISK)

(1) Only organic compounds without a regulatory limit in soils (USEPA, "Polychlorinated Biphenyls Spill Cleanup Policy Rule," 40 CFR Part 761) are shown.

(2) From ECC RI, Table 5-3, and Verschueren, 1983, "Handbook of Environmental Data on Organic Chemicals".

(3) From ECC RI, Table 5-3. Calculated as 10^log Kow * OC, where OC= organic carbon content = 0.00124. For isophorone and methyl isobutyl ketone, the Kd is obtained as Kd = Koc * OC, where Koc = organic carbon-water partition coefficient, obtained from log Koc = (-0.55 * log S) + 3.64 (Exhibit A-1 of "Superfund Public Health Evaluation Manual," 1986).

(4) RB = risk-based concentration, from Table B3; MCL = Maximum Contaminant Level, from 40 CFR 141; MCLGP = proposed MCL goal, from 40 CFR 141; LDWHA = lifetime drinking water health advisory, from "Superfund Public Health Evaluation Manual," 1986.

(5) Leachate discharge/subsurface water discharge = 0.0051 (Appendix C of the ECC RI; and reduction of the 7.8 in/yr recharge used in the RI under the current conditions (page 5-8) by 99 percent due to the cap).

(6) Soil concentration (ug/kg) = Kd * Concentration in leachate (ug/l).

Biphenyls Spill Cleanup Police Rule, 40 CFR Part 761) in soils are listed in Tables B5 and B6. It is conservatively assumed that the volume of leachate from the soils will be reduced by 99 percent from the 7.8 in/yr used in the RI, by installing the RCRA-compliant (Subtitle C) cover over the site.

A range of acceptable soil concentrations based on water ingestion using the published ranges for organic carbon content of till soils and the SARA range of risk for Superfund site cleanups, is presented in Table B7. A list of organic carbon content in soil is shown in Table B8, with the respective reference. The concentrations shown in Table B6 were used to determine the Acceptable Soil Concentrations specified in Table 3-1, using a risk of 10^{-6} and a soil organic carbon content of 0.12%, as presented in the RI. This soil organic carbon content was deemed conservative when compared to the values shown in Table B8.

Table B9 lists the solubility and vapor pressure of the organic compounds detected in the soils above the limits shown in Tables B5 and B6. All compounds, except bis(2-ethylhexyl)phthalate and Aroclor-1260, are amenable to removal by soil vapor extraction.

Finally, Table B10 presents the complete list of references used for the calculation of the Acceptable Soil Concentrations specified in Table 3-1.

TABLE B7

ECC - ACCEPTABLE SOIL CONCENTRATIONS BASED ON THEORETICAL SUBSURFACE WATER INGESTION AT THE SITE (RANGE OF RISKS)

Compound (1)	Range of Kd (2)	Acceptable Soil Concentration Based on Water Ingestion (3)		
		Range for 10-4 risk	Range for 10-7 risk	
VOLATILE ORGANICS (VOCs):				
Acetone	0.000058-0.0044	40-3,019	40-3,019	(4)
Chlorobenzene	0.069-5.24	814-61,600	814-61,600	(5)
Chloroform	0.0093-0.71	182-13,900	182-13,900	(5)
1,1-Dichloroethane	0.0062-0.47	46-3,500	0.046-3.50	
1,1-Dichloroethene	0.0069-0.52	9.47-714	9.47-714	(5)
Ethylbenzene	0.14-10.7	18,800-1,431,000	18,800-1,431,000	(5)
Methylene Chloride	0.0018-0.14	166-12,900	0.166-12.9	
Methyl Ethyl Ketone	0.00018-0.014	6.07-461	6.07-461	(5)
Methyl Isobutyl Ketone	0.0021-0.16	721-54,900	721-54,900	(4)
Tetrachloroethene	0.076-5.78	1,028-78,200	1.03-78.2	
Toluene	0.049-3.72	19,200-1,460,000	19,200-1,460,000	(5)
1,1,1-Trichloroethane	0.015-1.14	588-44,700	588-44,700	(5)
1,1,2-Trichloroethane	0.015-1.14	179-13,600	0.179-13.6	
Trichloroethene	0.020-1.52	19.6-1,490	19.6-1,490	(5)
Total Xylenes	0.18-13.7	15,700-1,193,000	15,700-1,193,000	(5)
BASE NEUTRAL/ACID ORGANICS:				
Bis(2-ethylhexyl)phthalate	50100-3810000	2,460,000,000-187,000,000,000	2,460,000-187,000,000	
Di-n-Butyl Phthalate	15.8-1200	10,800,000-824,000,000	10,800,000-824,000,000	(4)
Diethyl Phthalate	0.17-12.9	933,000-70,800,000	933,000-70,800,000	(4)
Isophorone	0.0025-0.19	417-31,700	0.417-31.7	
Naphthalene	0.1-7.6	275,000-20,900,000	275,000-20,900,000	(4)
Phenol	0.0029-0.22	796-60,400	796-60,400	(4)

NOTES:

(1) Only organic compounds without a regulatory limit in soils (USEPA, "Polychlorinated Biphenyls Spill Cleanup Policy Rule," 40 CFR Part 761) are shown.

(2) For a range of organic carbon content of 0.0001 to 0.0076 obtained from: U.S. Department of Agriculture, "Soil Classification - A Comprehensive System". Soil Conservation Service, 7th Approximation, 1960. Calculated as presented in Table B6.

(3) Acceptable Soil Concentrations at the risk shown (for compounds with potency) for a range of organic carbon content of 0.0001 to 0.0076. Calculated as presented in Table B6.

(4) Acceptable Soil Concentration range does not change because the compound does not have a potency factor.

(5) Acceptable Soil Concentration range does not change because the value is based on regulatory limits (drinking water Maximum Contaminant Level, Maximum Contaminant Level Goal, or lifetime health advisory).

TABLE B8 (Page 1 of 5)
ORGANIC CARBON CONTENT OF SOILS - REFERENCES

Organic Carbon Content, %	Type of Soil (depth)	Geographic Area	Reference
0.125 (avg over 1.5 acre site)	Loamy sand (4 ft)	Etiwanda, CA (arid region)	Elabd, H., and W.A. Jury. 1986. "Spatial variability of Pesticide Adsorption Parameters." Environmental Science and Technology, Vol. 20, No. 3, pp. 256-260.
0.2 (avg over 1.5 acre site)	Loamy sand (2 and 3 ft)	Ibid	Ibid
0.26 (avg over 1.5 acre site)	Loamy sand (1 ft)	Ibid	Ibid
1.9	Silt loam	Corvallis, OR	Chiou, C.T., P.E. Porter, and D.W. Schmeddign. 1983. "Partition Equilibria of Nonionic Organic Compounds between Soil Organic Matter and Water." Environmental Science and Technology, Vol. 17, No. 4, pp. 227-231.
0.15	Sand close to river	Switzerland	Schwarzenbach, R.P., and J. Westall. 1981. "Transport of Nonpolar Organic Compounds from Surface Water to Groundwater. Laboratory Sorption Studies." Environmental Science and Technology, Vol. 15, No. 11, pp. 1360-1367.
2.1	Air-dried soil	Iowa	Wu, S., and P.M. Gschwend. 1986. "Sorption Kinetics of Hydrophobic Organic Compounds to Natural Sediments and Soils." Environmental Science and Technology, Vol. 20, No. 7, pp. 717-725.
0.11	Loess sample	Turin, Iowa	Karickhoff, S.W. 1984. "Organic Pollutant Sorption in Aquatic Systems." Journal of Hydraulic Engineering, Vol. 110, No. 6, pp. 707-735.
1.3	Soil	Fern Clyffe State Park, IL	Ibid
0.02	Aquifer -- water table zone 98 % sand	Borden, Canada	Abdul, A.S., T.L. Gibson, and D.N. Rai. 1986. "The Effect of Organic Carbon on the Adsorption of Fluorene by Aquifer Materials." Hazardous Waste and Hazardous Materials. Vol. 3, No. 4, pp. 429-440.
0.52	Aquifer -- water table zone 87 % sand	Flint, MI	Ibid
1.8	Aquifer -- water table zone 91 % sand	Flint, MI	Ibid

TABLE 88 (Page 2 of 5)
ORGANIC CARBON CONTENT OF SOILS - REFERENCES

Organic Carbon Content, %	Type of Soil (depth)	Geographic Area	Reference
0.05	Fine-sand soil	Wilmington, DE	Stokman, S.K. 1987. "Estimates of Concentrations of Soluble Petroleum Hydrocarbons Migrating into Ground Water from Contaminated Soil Sources." Proceedings of the National Water Well Association/American Petroleum Institute Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water - Prevention, Detection and Restoration. Houston, TX, pp. 541-558.
0.1	Shaly-silt soil	Philadelphia, PA	Ibid
0.05	Fine to coarse sand, 96% sand	Michigan	Chiang, C.Y., C.L. Klein, J.P. Salanitro, and H.L. Wisniewski. 1986. "Data Analyses and Computer Modelling of the Benzene Plume in an Aquifer Beneath a Gas Plant." Proceedings of the National Water Well Association/American Petroleum Institute Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water - Prevention, Detection and Restoration. Houston, TX, pp. 157-176.
0.27	Lincoln fine sand (surface soil)	Little Sandy Creek near Ada, OK	Clark, G.L., A.T. Kan, and M.B. Tomson. 1986. "Kinetic Interaction of Neutral Trace Level Organic Compounds with Soil Organic Material." Proceedings of the National Water Well Association/American Petroleum Institute Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water - Prevention, Detection and Restoration. Houston, TX, pp. 151-156.
0.74	Fine to medium grained sand (3 ft)	Indian River County, FL	Kemblowski, M.W., J.P. Salinatro, G.M. Deeley, and C.C. Stanley. 1987. "Fate and Transport of Residual Hydrocarbon in Groundwater - A Case Study." Proceedings of the National Water Well Association/ American Petroleum Institute Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water - Prevention, Detection and Restoration. Houston, TX, pp. 207-231.
0.44	Fine to medium grained sand (7 ft)	Indian River County, FL	Ibid
0.12	Fine to medium grained sand (13 ft)	Indian River County, FL	Ibid

TABLE B8 (Page 3 of 5)
ORGANIC CARBON CONTENT OF SOILS - REFERENCES

Organic Carbon Content, %	Type of Soil (depth)	Geographic Area	Reference
0.36	Fine to medium grained sand (3 ft)	Indian River County, FL	Ibid
0.15	Fine to medium grained sand (13 ft)	Indian River County, FL	Ibid
1.08	Fine to medium grained sand (2 ft)	Indian River County, FL	Ibid
0.16	Fine to medium grained sand (11 ft)	Indian River County, FL	Ibid
0.72	Fine to medium grained sand (3 ft)	Indian River County, FL	Ibid
0.26	Fine to medium grained sand (10 ft)	Indian River County, FL	Ibid
0.74	Glacial till (1-2 ft)	Sargent County, ND	"Soil Classification - A Comprehensive System." 1960. U.S. Department of Agriculture, Soil Conservation Service, 7th Approximation.
0.33	Glacial till (2-3 ft)	Sargent County, ND	Ibid
0.18	Glacial till (4.5-5 ft)	Sargent County, ND	Ibid
0.1	Till (1-2 ft)	Strafford County, New Hampshire	Ibid
0.08	Till (2-3 ft)	Strafford County, New Hampshire	Ibid
0.03	Till (4-5 ft)	Strafford County, New Hampshire	Ibid
0.01	Till (5-7 ft)	Strafford County, New Hampshire	Ibid

ORGANIC CARBON CONTENT OF SOILS - REFERENCE

Organic Carbon Content, %	Type of Soil (depth)	Geographic Area
0.59	Calcareous, glacial till (1-2 ft)	Greenbrier County, West Virginia
0.27	Calcareous, glacial till (2-3 ft)	Greenbrier County, West Virginia
0.08	Calcareous, glacial till (4-5 ft)	Greenbrier County, West Virginia
0.38	Calcareous, glacial till (1-2 ft)	Tomkins County, New York
0.16	Calcareous, glacial till (2-3 ft)	Tomkins County, New York
0.17	Calcareous, glacial till (4.5-6.5 ft)	Tomkins County, New York
0.14	Calcareous, glacial till (6.5-7 ft)	Tomkins County, New York
0.76	Glacial till (1-2 ft)	Waseca County, Minnesota
0.3	Glacial till (2-3 ft)	Waseca County, Minnesota
0.19	Glacial till (> 4 ft)	Waseca County, Minnesota
0.51	Glacial till (1-2 ft)	Sargent County, ND
0.18	Glacial till (2-3 ft)	Sargent County, ND
0.16	Glacial till (3.5-5 ft)	Sargent County, ND

TABLE 88 (Page 5 of 5)
ORGANIC CARBON CONTENT OF SOILS - REFERENCES

Organic Carbon Content, %	Type of Soil (depth)	Geographic Area	Reference
0.64	Firm, glacial till (1-2 ft)	Spink County, SD	Ibid
0.36	Firm, glacial till (2-3 ft)	Spink County, SD	Ibid
0.31	Firm, glacial till (4-5 ft)	Spink County, SD	Ibid
0.46	Glacial till (1-2 ft)	Renville County, ND	Ibid
0.24	Glacial till (2-3 ft)	Renville County, ND	Ibid
0.13	Glacial till (4-5 ft)	Renville County, ND	Ibid
0.25	Glacial till (2-3 ft)	Adair County, Iowa	Ibid
0.08	Glacial till (> 6 ft)	Adair County, Iowa	Ibid
0.74	Calcareous, glacial till (1-2 ft)	Ward County, ND	Ibid
0.2	Calcareous, glacial till (2-3 ft)	Ward County, ND	Ibid
0.19	Calcareous, glacial till (4-5 ft)	Ward County, ND	Ibid
0.35	Glacial till (1-2 ft)	Cayuga County, NY	Ibid
0.1	Glacial till (2-3 ft)	Cayuga County, NY	Ibid
0.12	Glacial till (6-7 ft)	Cayuga County, NY	Ibid

TABLE B9
CHEMICAL PROPERTIES OF ORGANIC COMPOUNDS
DETECTED IN THE SOILS AT CONCENTRATIONS
ABOVE THE ACCEPTABLE SOIL CONCENTRATIONS (1)

Compound	Solubility (ug/l)	Vapor Pressure (mm Hg)
VOLATILE ORGANICS (VOCs):		
Acetone	1,000,000,000	270
Chloroform	8,200,000	151
1,1-Dichloroethane	5,500,000	182
1,1-Dichloroethene	2,250,000	600
Ethylbenzene	152,000	7
Methylene Chloride	20,000,000	362
Methyl Ethyl Ketone	268,000,000	77.5
Methyl Isobutyl Ketone	17,000,000	6
Tetrachloroethene	200,000	17.8
Toluene	535,000	28.1
1,1,1-Trichloroethane	4,400,000	123
1,1,2-Trichloroethane	4,500,000	30
Trichloroethene	1,100,000	57.9
Total Xylenes	198,000	10
BASE NEUTRAL/ACID ORGANICS:		
Bis(2-ethylhexyl)phthalate	1,300	0.0000002
Isophorone	12,000	0.38
Phenol	93,000,000	0.341
PESTICIDES/PCBs:		
Aroclor-1260 (2)	2.7	0.0000405

(1) Acceptable Soil Concentrations are determined in accordance with Footnotes 5, 6, and 7 of Table 3-1.
(2) Soil limit assumed for PCBs is 10,000 ug/kg (40 CFR Part 761.125, "Polychlorinated Biphenyls Spill Cleanup Policy Rule").

REFERENCES:

U.S. EPA, "Superfund Public Health Evaluation Manual," 1986.
U.S. EPA, "Water-Related Environmental Fate of 129 Priority Pollutants," December 1979.

TABLE B10

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Abdul A.S., T.L. Gibson, and D.N. Rai. 1986. "The Ef: Organic Carbon on the Adsorption of Fluorene by Materials." Hazardous Waste and Hazardous Materials. V No. 4, pp. 429-440.

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TABLE B10

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U.S. Department of Agriculture, Soil Conservation Service, "Soil Classification - A Comprehensive System." 1960, 7th Approximation.

USEPA, Office of Solid Waste and Emergency Response, "Memorandum on Interim Final Guidance for Soil Ingestion Rates," January 27, 1989.

USEPA, Region V, "Record of Decision for Environmental Conservation and Chemical Corporation, and Northside Sanitary Landfill, Zionsville, Indiana," September 25, 1987.

USEPA, "Draft RCRA Facility Investigation Guidance," July, 1987, OSWER Directive 9502.00-6C.

USEPA, "National Primary Drinking Water Regulations," 40 CFR 141, last amended by 53 FR 37408, September 26, 1988.

USEPA, "Polychlorinated Biphenyls Spill Cleanup Policy Rule," 40 CFR Part 761, published in the Federal Register on April 2, 1987.

USEPA, "Superfund Public Health Evaluation Manual," October, 1986, PB87-183125 with updates of November 16, 1987 and July, 1988.

USEPA, Toxics Integration Branch, OERR, Washington, D.C., December, 1988. "Memorandum with Corrections to the July, 1988 Update of the Risk Characterization Tables in the Superfund Public Health Evaluation Manual."

TABLE B10

REFERENCES

USEPA, "Water-Related Environmental Fate of 129 Priority Pollutants," December, 1979 PB80-204381.

US Geological Survey, "Background Geochemistry of Some Rocks, Soils, Plans, and Vegetables in the Conterminous United States," Professional Paper 574-F, 1975.

Veschueren, K., "Handbook of Environmental Data on Organic Chemicals," 1983.

APPENDIX C

ECC - VAPOR EXTRACTION MODEL

APPENDIX C

ECC - VAPOR EXTRACTION MODEL

This program was written in FORTRAN by Michael C. Marley and George E. Hoag and reported in "Induced Soil Venting for Recovery/Restoration of Gasoline Hydrocarbons in the Vadose Zone," Proceedings, Petroleum Hydrocarbons and Organic Chemicals in Ground Water Conference, Houston, TX, 1984.

The program is based on the concentration of each component in the vapor phase in the soil, using the partial pressure exerted by each compound, as expressed by the following equation:

$$ZT = \frac{VP * X * V * MW}{R * T}$$

where:

ZT = concentration of the component in the vapor phase, mg/l
VP = vapor pressure of compound, mm Hg
X = mole fraction = moles of component/total moles of organics in soil
V = volume of element, liters
MW = molecular weight of component
R = gas constant = 82.4 atm - cm^3/gmoles^oK
T = temperature = 294.25^oK

The program uses the finite difference method to calculate the change in number of moles of each component during a small time interval (i) and then recalculate over the next time interval (i+1), using the reduced number of moles resulting from subtracting the change in number of moles calculated for interval i from the number of moles present in the soil at the beginning of interval i.

The program runs for a finite length of time or until all the components are removed. The program was rewritten in BASIC and applied to the ECC site.

Table C-1 shows the chemical data used to run the model. The compounds to be evaluated are those shown in Table 3-2, which are amenable to removal by vapor extraction. The maximum detected soil concentrations were taken from Section 4 of the ECC RI, while the vapor pressure and molecular weight data are from USEPA, "Superfund Public Health Evaluation Manual," 1986.

As there was significant variation of compounds concentrations between soil samples at the site, a theoretical block size was chosen. This theoretical soil block is 10 ft x 10 ft x 2 ft deep and was assumed to contain all components of interest at their maximum detected concentrations (Table C-1). Furthermore, it was conservatively assumed that the air flow through the soil would only be 15% efficient in removing the organics. In effect, this represents a worst case estimate of the time required to remove the organics from the soils. The mass of this block was estimated as 10,200 kg.

TABLE C1
CHEMICAL DATA OF COMPOUNDS

Compound (1)	Molecular Weight (2)	Vapor Pressure (2) (mm Hg)	Maximum Detected Soil Concentration (3) (ug/kg)
VOLATILE ORGANICS:			
Acetone	58.1	270	650,000
Chloroform	119	151	2,900
1,1-Dichloroethane	99	182	35,000
1,1-Dichloroethene	97	600	380
Ethylbenzene	106	7	1,500,000
Methylene Chloride	85	362	310,000
Methyl Ethyl Ketone	72.1	77.5	2,800,000
Methyl Isobutyl Ketone	100	6	190,000
Tetrachloroethene	166	17.8	650,000
Toluene	92.1	28.1	2,000,000
1,1,1-Trichloroethane	133	123	1,100,000
1,1,2-Trichloroethane	133	30	550
Trichloroethene	132	57.9	4,800,000
BASE NEUTRAL/ACID ORGANICS:			
Phenol	94.1	0.341	570,000
Isophorone	138	0.38	440,000

(1) Compounds shown are those amenable to soil vapor extraction.
(2) From U.S. EPA, "Superfund Public Health Evaluation Manual," 1986.
(3) From ECC RI, March 1986.

The air flow rate was estimated as a fraction of the total air flow rate to be used at the site (500 SCFM), based on the length of injection trench influencing the assumed soil block (10 ft) as a ratio of the total length of injection trenches (3,800 ft). This represents an air flow rate of 37.26 liters per minute.

The results, summarized in Figure C1, show that essentially no VOCs will be present in the hypothetical soil element after 130 days of soil vapor extraction. To remove phenol and isophorone to the Acceptable Soil Concentrations in Table 3-1, operation of the vapor extraction system for a total of approximately 360 days is necessary.

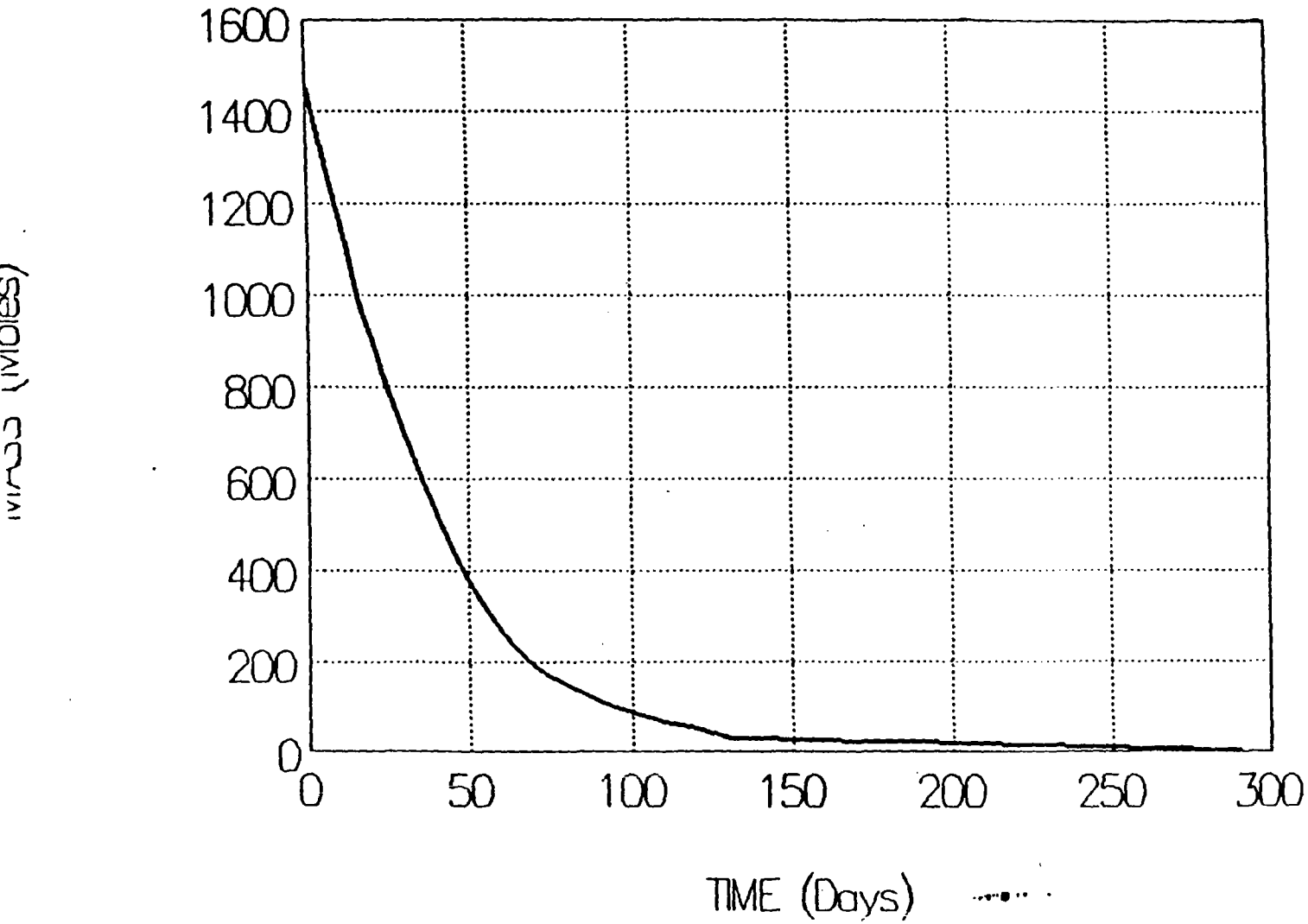
Actual large-scale soil vapor extraction systems have been operated with excellent removals of compounds such as tetrachloroethene, trichloroethene, 1,3-dichloropropene, methyl ethyl ketone, methyl isobutyl ketone, toluene, and xylenes. Some published references are:

- Lisiecki, J.B., and F.C. Payne. "Enhanced Volatilization: Possibilities, Practicalities, and Performance." Presented at the Engineering Foundation Conference, Mercersburg, PA, August 7-12, 1988.

- Regalbuto, D.P., J.A. Barrera and J.B. Lisiecki. "In-Situ Removal of VOCs by Means of Enhanced Volatilization." Proceedings of the Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection, and Restoration, Houston, TX, November 9-11, 1988.

Figure 1

ECC VAPOR EXTRACTION MODEL RESULTS



- Johnson, J.J., and R.J. Sterrett. "Analysis of In-Situ Soil Air Stripping Data." Proceedings of the 5th National Conference on Hazardous Wastes and Hazardous Materials, Las Vegas, Nevada, April 19-21, 1988.

A full-scale vapor extraction system (Lisiecki and Payne, 19 was able to remove tetrachloroethene from 5,600,000 ug/kg to ug/kg, as found by soil sample analysis, in 280 days. Therefo both theoretical models and actual results show that the requi removals will be accomplished by vapor extraction.

APPENDIX D

CALCULATION OF SOIL VAPOR CONCENTRATIONS

APPENDIX D

CALCULATION OF SOIL VAPOR CONCENTRATIONS

The methodology to determine the soil vapor concentrations in equilibrium with Acceptable Soil Concentrations in Table 3-1 is presented below.

The soil vapor concentration of a chemical in equilibrium with the concentration in the soil particles is a function of the soil to water partition coefficient and of the air to water partition coefficient [Lyman, W.J., W.F. Reehl and D.H. Rosenblatt, "Handbook of Chemical Property Estimation Methods," McGraw-Hill, Inc., 1982].

Since not all soil moisture will be evaporated during operation of the vapor extraction system (the soil's hygroscopic water will not be removed by the anticipated operating pressures), a relationship between soil vapor and soil moisture concentrations for the site's soils can be expressed as [Ibid] =

$$C_{sv} = H \cdot C_{sm}$$

where:

C_{sv} = concentration of compound in soil vapor, mg/l

H = Henry's Law Coefficient (nondimensional)

$$= \frac{Vp \cdot MW}{S \cdot R \cdot T}$$

V_p = vapor pressure of compound, mm Hg

MW = molecular weight of the compound, g/gmole

S = solubility of the compound, g/cm^3

R = gas law constant = 62,361 mm Hg - $cm^3/gmole-^oK$

T = soil temperature = 283 ^oK

C_{sm} = concentration of compound in soil moisture, mg/l

Similarly, the concentration in soil moisture in equilibrium with the concentration in soil particles can be calculated as [Ibid] =

$$C_{sm} = \frac{C_{sp}}{K_d}$$

where:

C_{sp} = concentration of compound in soil samples, mg/kg

K_d = soil-water partition coefficient, l/kg [from Appendix B, Table B6]

Combining the two equations, a relationship between soil vapor and soil samples concentration is obtained [Silka, L.R., "Simulation of the Movement of Volatile Organic Vapor Through the Unsaturated Zone as it Pertains to Soil-Gas Surveys," Proceedings of the NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water, 1986, p.204] =

$$C_{sv} = C_{sp} \cdot \frac{H}{K_d}$$

Table D1 presents the data and calculations of the soil vapo concentration in equilibrium with the Acceptable Soi Concentrations in Table 3-1. None of the results shown in Tabl D1 is above the corresponding vapor saturation concentration, c the concentration in vapor in equilibrium with the pure compound The vapor saturation concentrations for the compounds in Tabl D1, assuming each compound is present by itself in the soil vapo (i.e., molar fraction is equal to 1), are shown in Table D2. The vapor saturation concentration is calculated as:

$$C_{sat} = \frac{Vp \cdot X \cdot MW}{R \cdot T} \times 10^6$$

where:

Csat = vapor saturation concentration, mg/l

X = molar fraction of compound in vapor, assumed to be 1

10^6 = factor to convert g/cm^3 to mg/l

TABLE D1 (Page 1 of 2)
SOIL VAPOR CONCENTRATIONS IN EQUILIBRIUM
WITH ACCEPTABLE SOIL CONCENTRATIONS (1)

Compound (2)	Molecular Weight (3) (g/gmole)	Vapor Pressure (3) (mm Hg)	Solubility (3) (ug/l)	Henry's Law Constant (4) (dimensionless)	Soil-water Partition Coefficient (5) (l/kg)	Acceptable Soil Concentration (6) (ug/kg)	Soil Vapor Concentration (7) (mg/l)	Soil Vapor Concentration (7) ppmv
VOLATILE ORGANICS (VOCs):								
Acetone	58.1	270	1,000,000,000	0.000889	0.00071	490	0.613	254
Chloroform	119	151	8,200,000	0.124	0.116	2,300	2.46	496
1,1-Dichloroethane	99	182	5,500,000	0.186	0.076	5.7	0.014	3.39
1,1-Dichloroethene	97	600	2,250,000	1.47	0.086	120	2.045	515
Ethylbenzene	106	7	152,000	0.277	1.75	234,000	37	9,316
Methylene Chloride	84.9	362	20,000,000	0.0871	0.022	20	0.079	22.4
Methyl Ethyl Ketone	72.1	77.5	268,000,000	0.00118	0.00226	75	0.039	13
Methyl Isobutyl Ketone	100	6	17,000,000	0.00200	0.026	8,900	0.685	233
Tetrachloroethene	166	17.8	200,000	0.837	0.941	130	0.116	16.8
Toluene	92.1	28.1	535,000	0.274	0.607	238,000	107	36,556
1,1,1-Trichloroethane	133	123	4,400,000	0.211	0.183	7,200	8.29	2,819
1,1,2-Trichloroethane	133	30	4,500,000	0.0502	0.183	22	0.0060	1.09
Trichloroethene	132	57.9	1,100,000	0.394	0.242	240	0.39	71.5
Total Xylenes	106	10	198,000	0.303	2.26	195,000	26.2	4,794
BASE NEUTRAL/ACID ORGANICS:								
Phenol	94.1	0.341	93,000,000	0.0000196	0.036	9,800	0.0053	1.36

TABLE D1 (Page 2 of 2)
SOIL VAPOR CONCENTRATIONS IN EQUILIBRIUM
WITH ACCEPTABLE SOIL CONCENTRATIONS (1)

NOTES:

(1) Acceptable Soil Concentrations are determined in accordance with Footnotes 5 and 6 of Table 3-1.
(2) Compounds above Acceptable Soil Concentrations in Table 3-1 to be removed by vapor extraction.
(3) Data from U.S. EPA, "Superfund Public Health Evaluation Manual," 1986.
(4) Calculated as:

$$\text{Henry's Law Constant (nondimensional)} = \frac{\text{(Vapor Pressure, mm Hg)} * \text{(Molecular Weight, g/gmole)} * \text{(1,000,000 ug/g)} * \text{(1,000 cm3/l)}}{\text{(Solubility, ug/l)} * \text{(R, mm Hg-cm3/gmole-K)} * \text{(T, K)}}$$

where: R = gas law constant = 62,361 mm Hg-cm3/gmole-K; and T = soil temperature = 283 K.

(5) From Appendix B, Table B6.
(6) From Table 3-1.
(7) Calculated as:

$$\text{Concentration in soil vapor (mg/l)} = \frac{\text{(Concentration in soil, ug/kg)} * \text{(Henry's Law Constant, nondimensional)}}{\text{(Partition coefficient, l/kg)} * \text{(1000 ug/mg)}}$$

$$\text{Concentration in soil vapor (ppmv)} = \text{(Concentration in soil vapor, mg/l)} * \text{(1000 l/m3)} / \text{(Factor, mg/m3/ppmv)}$$

The factors for conversion of mg/m3 to parts per million by volume (ppmv) were obtained from Vershueren, K., "Handbook of Environmental Environmental Data on Organic Chemicals," 2nd Edition, 1983.

TABLE D2
CALCULATION OF VAPOR SATURATION CONCENTRATIONS

Compound (1)	Vapor Pressure (2) (mm Hg)	Molecular Weight (2) (g/gmole)	Vapor Saturation Concentration (3) (mg/l)
VOLATILE ORGANICS (VOCs):			
Acetone	270	58.1	888.9
Chloroform	151	119	1018.2
1,1-Dichloroethane	182	99	1021.0
1,1-Dichloroethene	600	97	3297.8
Ethylbenzene	7	106	42.0
Methylene Chloride	362	84.9	1741.5
Methyl Ethyl Ketone	77.5	72.1	316.6
Methyl Isobutyl Ketone	6	100	34.0
Tetrachloroethene	17.8	166	167.4
Toluene	28.1	92.1	146.6
1,1,1-Trichloroethane	123	133	927.0
1,1,2-Trichloroethane	30	133	226.1
Trichloroethene	57.9	132	433.1
Total Xylenes	10	106	60.1
BASE NEUTRAL/ACID ORGANICS:			
Phenol	0.341	94.1	1.8

(1) Compounds above Acceptable Soil Concentrations in Table 3-1 to be removed by vapor extraction.
(2) Data from U.S. EPA, "Superfund Public Health Evaluation Manual," 1986.
(3) Calculated as:

$$Csat = \frac{Vp * X * MW}{R * T} * 1E+06$$

Where: Csat = vapor saturation concentration, mg/l; X = molar fraction of compound in vapor, assumed to be 1; 1E+06 = factor to convert g/cm3 to mg/l; MW = molecular weight of the compound, g/gmole; R = gas law constant, 62,361 mm Hg-cm3/gmole-K; and T = soil temperature, 283 K.